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CLIMATE AND THE UPPER RESPIRATORY SYSTEM

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Climate may be defined as the atmospheric factors affecting vegetable and animal life, including temperature, humidity, sunlight and movements of the air as winds as well as waters and locations.

As early as 2300 B. C. it was recorded that people from the shores of the Mediterranean Sea traveled eastward to China because of droughts which rendered their former homes impossible. It is not strange to find that the Greek philosophers studied the climate and its influence and that many temples of health were built. Baths were established; water from springs was used, and open air theaters were built to accommodate as many as 20,000 to 25,000 persons. The Greeks perfected physical development above learning and thought that illness of the soul could be reached through the body.

About 300 B. C. Hippocrates, the father of medicine, wrote an interesting book on "Airs, Waters and Places." This book was no doubt the first ever written on climatology.

In the introduction Hippocrates [1] stated:

> Whoever wishes to investigate medicine properly should proceed thus: In the first place consider the seasons of the year, and what effects each of them produces, for they are not all alike, but differ much from themselves in regard to their changes. Then the winds, the hot and the cold, especially such as are common to both countries, and then such as are peculiar to each locality. We must also consider the qualities of the waters; as they differ from one another in taste and weight, so also do they differ much in their qualities. In the same manner, when one comes into the city to which he is a stranger, he ought to consider its situation, how it lies as to the winds and rising of the Sun; for its influence is not the same, whether it lies to the North or to the South, to the rising or the setting Sun.

Hippocrates used these observations in his practice of medicine, which helped to overcome the superstitions of his day and dominated

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1. Rochester, De Lancey: Climatology as Practiced by Hippocrates, Tr. Am. Climat. & Clin. A. **28**:33, 1912.

medical practice for many years. The first baths were established in Rome about 100 B. C. Their location was chosen for climate and natural springs, and they were the beginning of the fashionable watering places. During the Roman occupation of Britain health resorts and spas were established, some of which still exist. In 1628, in Harvey's time, the practice of medicine was put on a scientific basis. Thomas Sydenham, the father of clinical medicine, emphasized seasonal changes and the effects of altitude in regard to disease, and in the eighteenth century travelers began to realize the great dangers from the unfavorable climates in certain localities.

In the past century numerous climatic diseases have been conquered through the advancement of science. In the past few years members of the medical profession have taken a greater interest in climatic conditions and their effects on the body, for it has been demonstrated that climatic environment and diet have a great influence on development of the body. It is a fact that Italians, Japanese and other persons from foreign countries living in the northern part of the United States are larger, heavier and physically superior to those remaining in their home countries.[2] One may say that there are many other influences which might be responsible, but it has been proved by experiments on mice that climatic conditions greatly influence growth.[3] In the tropics growth of the body is slower. Puberty and maturity of sex function come on earlier in cool climates both in animals and in man.

As the amount of oxygen or the proportion of carbon dioxide may vary between wide limits without producing physiologic effects, the chemical constituents of the air can be discarded as of no great importance. At present the influence of climatic conditions is explained by the physiologic effects of the air on the human body, as influenced by temperature, humidity and movements of the air. The vasomotor contraction of the vessels of the skin due to cold causes dilatation of the vessels in other parts of the body and makes one more susceptible to disease. In a healthy man the internal temperature is usually constant, varying no more than 1 or 2 F. in the Arctic regions or in the tropics. Man, however, can adapt himself to extremes in weather more than any other animal. His skin and vasomotor system have more ability to regulate his heat, which is the end-result of metabolism. The elimination of heat depends on the surrounding air for its evaporation of moisture. If the air is saturated with moisture and there is little or no wind stirring, the heat is not eliminated. It has been shown by

2. Mills, C. A.: Health and Disease as Influenced by Climatic Environment, Internat. Clin. **2**:143 (June) 1936.

3. Ogle, Cordelia: Climatic Influence on the Growth of the Male Albino Mouse, Am. J. Physiol. **107**:635 (March) 1934.

Haldane and Smith [4] in observations on miners that during rest the rectal temperature does not increase until the wet bulb thermometer registers 88 F. For each degree or so above that there is a rise in rectal temperature. In moving air the rectal temperature did not rise until a temperature of 93 F. or above was reached, which seems to indicate that the velocity of the wind has a great influence on physical comfort at the higher temperatures. The atmosphere is the most imporportant factor in the environment in which men live. By weight, a human being takes as much air into the body as he does food each day. The lungs and the skin are immediately concerned when the autonomic balance is disturbed by too much heat.

The local effects transmitted through the nervous impulses are of great importance. Vascular changes take place in the mucous membranes of the upper respiratory tract as well as in those of the kidneys and splanchnic areas, producing a state of ischemia of the mucous membranes, which are thus more vulnerable to penetration by bacteria.

With the effects of the winds and cold on delicate children, a decided increase of basal metabolic rate is noticed. Many pathologists and physiologists have become interested in the loss of chlorides and dehydration produced by excessive atmospheric heat. The p_H of the blood is increased, and frequently the carbon dioxide content is lowered. Persons working in excessive heat and sweating freely have become faint and weak because of the loss of chlorides. Many of the large manufacturing companies have installed machines near the drinking water for dispensing tablets of sodium chloride to encourage the men employed to take them and avoid these ill effects.

High winds tend to have the same effect on changing the moisture of the atmosphere and must have some effect on body moisture. Dry air generally causes a feeling of comfort and well-being regardless of the temperature, while moist air leads to discomfort and depression.

On account of differences in conduction of heat, moist cold air feels cooler and moist warm air hotter than dry air of the same temperature. Therefore, the effects on the physiologic mechanism of adaptation to temperature will be much greater and the demand on the autonomic nervous system beyond the point of normal adjustment will be greater, thus increasing vulnerability to disease. Johnson [5] was the first to suggest that the pathogenic effects of catarrh and colds may be linked to the autonomic nervous sytem because when the climatic

4. Haldane, J., and Smith, J. L.: The Toxic Action of Expired Air, J. Path. & Bact. **1**:318, 1893.

5. Peterson, W. F.: The Patient and the Weather, Ann Arbor, Mich., Edwards Brothers, Inc., 1936, vol. 1, pt. 2.

conditions cause an unduly frequent change in temperature of great magnitude the autonomic nervous system is fatigued. Kühn [6] expressed the belief that long exposure to cold produces dryness of the mucous membranes and leads to greater susceptibility to infection of the upper respiratory tract. Mills claimed that in many types of chronic illness the weather plays an active rôle, for regions of highly changeable temperature and pressure (stormy zones) usually have a population badly affected with chronic respiratory and arthritic troubles, sinusitis, chronic bronchitis, tuberculosis and rheumatoid arthritis.

Miller and Cocks [7] brought before the members of the medical profession their experiments on the human body in regard to various temperatures, humidity and movements of the air several years ago. Their records were interesting to me, but I felt that their statement that over 50 per cent of laundry workers exposed to moist heat acquire atrophic rhinitis does not apply in Atlantic City. When I came here twenty-five years ago and became connected with the Atlantic City Hospital I was surprised that I did not see patients with atrophic rhinitis in the clinics. In New York at that time chronic disease of the nose and throat was of that type in about 50 per cent of all cases. What few patients with atrophic rhinitis I did observe in the clinics here were persons from out of town who were here for their vacations. In all the time I have been here I have never seen a patient with atrophic rhinitis whose entire time was spent at the seashore. Besides, I have records of several persons who came here with atrophic rhinitis, but after a few years one would never be able to tell by examining their noses that they had ever had it. I was so interested in Miller and Cock's work that I decided to examine the laundry workers in this city. In different hotels and commercial laundries I examined 268 persons, and to my surprise did not find any with atrophic rhinitis. These persons had been engaged in laundry work for an average of nine plus years; a great number had followed the work for twenty years or more and several for over thirty years. The laundries are all above the ground, with plenty of fresh air and sunshine, and no factories or other agents fill the air with impurities. My conclusion is that the climatic environment here is no doubt responsible for the difference.

In training for my special work I was impressed with the fact that sea air seemed to be bad for acute infections of the upper respiratory tract. After many years of observation I have concluded that that

6. Kühn, A.: Abhärtung und Erkältung, Berl. Klin. **21**:1, 1909.

7. Miller, J. A., and Cocks, G. H.: The Effect of Changes in Atmospheric Conditions upon the Upper Respiratory Tract, Tr. Am. Climat. & Clin. A. **31**: 31, 1915.

TABLE 1.—*Meteorologic Data for Various Cities*

	January	February	March	April	May	June	July	August	September	October	November	December
Atlantic City, N. J.												
Mean maximum temperature..	38	36	50	54	68	73	80	80	73	66	53	48
Mean minimum temperature...	25	22	38	41	53	62	68	68	63	53	38	34
Difference.....	13	14	12	13	15	11	12	12	10	13	15	14
Average wind velocity, miles per hour.....	16.8	15.6	17.5	15.1	14.8	14.8	13.1	14.2	15.9	14.7	16.7	17.7
Humidity, percentage												
8 a. m.	79	75	83	72	71	82	77	80	82	82	70	77
12 noon.....	66	64	75	64	65	74	70	72	73	66	55	69
8 p. m.	70	70	78	70	74	80	80	79	82	75	63	73
Difference between high and low.....	13	11	8	8	6	8	7	8	9	6	15	8
Los Angeles												
Mean maximum temperature..	67.7	63.3	67.4	69.2	73.9	77.9	83.0	82.7	79.0	76.4	78.4	67.1
Mean minimum temperature...	51.0	49.4	50.7	52.1	60.0	65.2	64.1	61.4	61.4	58.5	57.1	50.2
Difference.....	16.7	14.2	16.7	15.1	16.6	17.9	17.8	18.6	17.6	17.9	21.3	16.9
Average wind velocity, miles per hour.....	5.7	6.5	5.9	5.9	6.0	5.8	5.6	5.5	5.3	5.8	5.8	6.3
Humidity, percentage												
5 a. m.	56	80	80	85	78	86	84	88	82	75	42	60
12 noon.....	38	57	52	56	60	53	50	52	49	47	26	44
5 p. m.	47	65	59	61	56	56	59	56	59	60	34	56
Difference between high and low.....	18	23	28	29	29	33	34	30	33	28	16	16
Jacksonville, Fla.												
Mean maximum temperature..	64.5	62.8	73.8	78.4	82.6	87.1	80.8	90.1	87.9	80.3	69.3	65.1
Mean minimum temperature...	45.3	44.6	55.6	59.4	66.7	71.0	64.0	74.1	72.8	66.0	52.0	49.3
Difference.....	19.2	18.2	18.2	19.0	15.9	16.1	16.8	16.0	15.1	14.3	17.3	15.8
Average wind velocity, miles per hour.....	7.8	8.7	9.0	9.1	8.2	7.4	8.1	6.8	7.0	7.9	8.0	8.5
Humidity, percentage												
8 a. m.	89	88	82	76	78	79	81	85	86	88	80	93
12 noon.....	61	54	52	48	54	58	56	58	60	66	58	75
8 p. m.	70	74	63	63	72	74	72	78	77	83	72	86
Difference between high and low.....	28	34	30	28	24	21	25	27	26	22	22	18
Portland, Ore.												
Mean maximum temperature..	48.5	38.9	52.5	64.5	70.7	73.8	77.7	80.4	73.2	68.2	52.9	47.3
Mean minimum temperature...	39.8	28.9	38.1	46.6	51.7	56.5	57.8	58.6	53.7	49.1	38.1	40.2
Difference.....	8.7	10.0	14.4	17.9	19.0	17.3	19.9	21.8	19.5	19.1	14.8	7.1
Average wind velocity, miles per hour.....	7.7	8.4	6.7	5.6	6.9	6.2	6.5	6.2	6.5	5.3	5.0	6.8
Humidity, percentage												
5 a. m.	82	73	84	86	82	85	84	82	82	87	83	89
12 noon.....	73	66	67	58	54	56	53	51	56	60	65	84
5 p. m.	74	69	63	51	50	54	46	42	49	54	66	84
Difference between high and low.....	9	7	21	35	32	31	38	40	33	33	18	5
Atlanta, Ga.												
Mean maximum temperature..	48.8	51.3	68.4	69.5	85.6	91.8	91.5	89.6	86.0	78.4	69.2	54.0
Mean minimum temperature...	29.3	32.0	44.9	48.0	60.5	67.1	70.8	70.0	66.1	55.5	40.0	39.2
Difference.....	19.5	19.3	23.5	21.5	25.1	24.7	20.7	19.6	19.9	22.9	29.2	14.8
Average wind velocity, miles per hour.....	10.0	10.6	9.5	8.5	6.9	7.2	6.5	6.6	6.9	6.5	8.0	10.2
Humidity, percentage												
7 a. m.	80	80	84	83	81	75	86	85	86	81	89	78
12 noon.....	80	60	61	60	51	47	58	57	53	46	60	63
7 p. m.	68	66	64	68	62	58	71	71	70	67	76	67
Difference between high and low.....	20	20	23	23	30	28	28	28	33	35	29	15
San Diego, Calif.												
Mean maximum temperature..	64.5	62.8	63.1	63.7	68.6	70.1	74.3	76.3	73.4	71.1	73.4	66.2
Mean minimum temperature...	48.6	49.8	51.7	52.7	57.9	60.5	65.8	66.4	62.7	59.0	54.0	50.0
Difference.....	15.9	13.0	11.4	11.0	10.7	9.6	9.5	9.9	10.7	12.1	19.4	16.2
Average wind velocity, miles per hour.....	5.1	7.0	7.3	7.2	7.4	7.2	6.5	6.8	6.8	6.7	5.6	6.4
Humidity, percentage												
5 a. m.	72	79	80	82	83	86	88	87	85	81	70	69
12 noon.....	56	64	62	67	69	72	73	73	70	65	53	56
5 p. m.	68	69	68	69	72	73	74	74	73	72	67	67
Difference between high and low.....	16	15	18	15	14	14	15	14	15	16	17	13

TABLE 1.—*Meteorologic Data for Various Cities—Continued*

	January	February	March	April	May	June	July	August	September	October	November	December
Boston												
Mean maximum temperature..	35.3	30.1	49.1	52.7	71.1	74.1	80.0	78.0	70.0	62.8	47.5	42.9
Mean minimum temperature...	21.0	15.5	34.4	37.8	50.2	58.2	62.2	61.4	55.2	46.1	31.5	27.0
Difference.....	14.3	14.6	14.7	14.9	20.9	15.9	17.8	16.6	14.8	16.7	16.0	13.9
Average wind velocity, miles per hour.....	12.6	11.5	10.7	12.3	11.2	10.0	9.1	8.7	9.8	10.0	11.3	11.0
Humidity, percentage												
8 a. m.	75	66	78	69	64	71	72	78	78	75	70	79
12 noon.....	61	59	68	57	51	61	57	60	64	58	55	68
8 p. m.	67	58	73	63	64	72	70	76	78	69	63	72
Difference between high and low.....	14	8	10	12	13	10	15	18	14	17	15	11
Chicago												
Mean maximum temperature..	25.1	28.5	47.2	51.2	78.5	73.4	84.7	83.0	75.1	61.1	44.8	40.7
Mean minimum temperature...	12.9	7.0	32.1	36.1	55.4	55.7	69.0	66.9	61.2	46.1	31.1	27.3
Difference.....	12.2	21.5	15.1	15.1	23.1	18.7	15.7	16.1	13.9	15.0	13.7	13.4
Average wind velocity, miles per hour.....	11.1	11.9	11.5	10.7	9.7	9.8	7.1	9.2	9.3	10.3	12.1	11.3
Humidity, percentage												
7 a. m.	80	78	76	71	70	70	66	78	82	78	73	80
12 noon.....	72	70	57	58	52	58	55	59	65	62	62	66
7 p. m.	74	71	61	64	56	59	58	67	73	68	66	74
Difference between high and low.....	8	8	19	13	18	12	11	19	17	16	13	14

is not true. In both hospital and private practice at the shore I do not observe as many cases of acute purulent disease of the sinuses, ears or mastoids or of tracheal disease as in the cities. From an article read before the American Climatological and Clinical Association by a successful internist, Dr. Philip Marvel,[8] who has had over fifty years of observation of the climate here, I quote:

> Infections are notably less prevalent at the sea-shore, milder in form, and shorter in period of invasion than is observed inland and in large commercial cities, this is especially true when the physical comforts are comparable with climatic advantages. Pneumonia per se is rarely observed in Atlantic City. When seen here it is usually in complication with some other form of infection, and most frequently of the bronchial type; even the latter is comparatively rare, estimated on the basis of City Hospital statistics. The same is also true of various other forms of infectious diseases—gripp, tonsillitis, whooping-cough, influenza, etc. The rarity with which these are associated with pneumonia, endocarditis, pleurisy, sinusitis, synovitis, etc., is no less than remarkable compared with similar cases in the large cities, and chronic sequelae are little heard of where cases are properly observed through the convalescing period; all of which is particularly strong in affirmation that the physical properties of the atmosphere and the relative advantages of the climate of this locality must be, in some measure, both protective and prohibitory.

8. Marvel, Philip: Some Remarks on Thirty Odd Years of Continuous Climatic Observations in Atlantic City, Tr. Am. Climat. & Clin. A. **28**:114, 1912.

Huntington [9] stated that changes of temperature of a few degrees during the day are healthful and tend to produce a stimulating effect which induces a relatively low death rate. A sharp drop of temperature or a sharp rise of temperature is not good. Even a stable temperature with no change is not for the best.

Here one has a climate controlled by a large body of water, the ocean, a summer and winter temperature that varies only 13 F. between the mean monthly maximum and the mean monthly minimum, a humidity that averages about 73 per cent, with a wind velocity of 15 miles per hour, a sandy soil which quickly absorbs any precipitation and air that is free from the impurities commonly found in a large city. The summer winds are from the south over the ocean, and the winter winds, from the west and northwest over the native pine and

TABLE 2.—*Difference Between Maximum and Minimum Average Hourly Percentage of Humidity, with the Average Velocity of the Wind*

City	January	February	March	April	May	June	July	August	September	October	November	December	Wind, M. P. H.
Atlantic City, N. J.	13	11	8	8	6	8	7	8	9	6	15	8	15.7
Los Angeles	18	23	28	29	28	33	34	36	23	28	16	16	5.8
Jacksonville, Fla.	28	34	30	28	24	21	25	27	26	22	22	18	8.0
Portland, Ore.	9	7	21	35	32	31	38	40	33	33	18	5	6.5
Atlanta, Ga.	20	20	23	23	30	28	28	28	33	35	29	15	8.1
Boston	14	8	10	12	13	10	15	18	14	17	15	11	10.7
San Diego, Calif.	16	15	18	15	14	14	15	14	15	16	17	13	6.7
Chicago	8	8	19	13	18	12	11	19	17	16	13	14	10.3

cedar forests. All this seems to account for the observations made concerning the climatic conditions in this location.

SUMMARY

Since the time of Hippocrates members of the medical profession have been interested in the relation of climatic conditions to health.

People are greatly influenced by climate in their ability to resist infection of the upper respiratory system.

The autonomic nervous system plays a great rôle in the lives of human beings, and it behooves all physicians to give it consideration.

Persons working in laundries with high temperature and moist heat do not seem to acquire atrophic rhinitis in this city.

The climatic environment of this locality seems to prevent atrophic rhinitis.

9. Huntington, Ellsworth: Weather and Health, Bulletin 75, National Research Council, 1930.

After living a few years in the air of the seashore in this location, persons with atrophic rhinitis seem to improve.

Acute infections of the upper respiratory system are fewer and not so severe in this climate as in the large cities.

According to the records of the United States Weather Bureau of temperature, humidity, sunshine and wind velocity for this city as compared to other localities, Atlantic City has a great deal to offer to those suffering from infections of the upper respiratory tract.

OSTEOMYELITIS OF THE SKULL

COMPARISON OF TWO CASES OBSERVED SEVENTEEN AND FOURTEEN YEARS AGO WITH TWO OBSERVED IN THE PAST TWO YEARS

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Osteomyelitis of the skull is a condition in which, because of meager personal experience, physicians are dependent on the literature. This is not a systematic paper on the subject. Rather it is an attempt to show the effect of certain outstanding contributions to the literature on the management of the disease. Four cases of osteomyelitis of the frontal bone are reported, two of which were observed seventeen and fourteen years ago and two within the past two years. All the patients were treated radically. In one case, which resulted fatally, the disease was of streptococcic origin. In three it followed acute frontal sinusitis. In one it resulted from an orbital abscess and had its inception in the temporal fossa. No attempt will be made to discuss the etiology, symptomatology, pathology or bacteriology. These have been thoroughly covered in the literature, and repetition without new findings is worse than useless.

In 1913 McKenzie [1] published the outstanding paper on this subject up to that time, quoting from the previous works of Tilley, Luc, Schilling and other investigators. He discussed the mode of invasion, stating that it can take place along the venous channels as well as by direct extension. He recognized regeneration of bone taking place after the activity of the process had subsided. He stated that extradural abscesses are to be expected. A sure diagnostic sign is edema, often some distance away. "The disease burrows like a mole in the earth and, like a mole, throws up mounds here and there as it goes along." He quoted Killian as reporting the occurrence of thrombophlebitis of the longitudinal sinus following osteomyelitis. He suggested distant trephining and urged immediate and radical operation. "Wheresoever the disease has spread, there must the surgeon follow it."

CASE 1.—In 1920 a girl aged 18 was referred to me because of headache, fever and swelling over the left eye of three weeks' duration following influenza. The eyelid was red and swollen and showed a discharging fistula where it had

Read at the Fifty-Ninth Annual Congress of the American Laryngological Association, Atlantic City, N. J., June 1, 1937.

1. McKenzie, D.: Osteomyelitis of Frontal Bone, J. Laryng. **28**:6, 1913-1914.

been incised by her local physician. There was edema extending almost to the hair line and another discharging fistula about 1 inch (2.5 cm.) above the left eyebrow. Culture showed a growth of Staphylococcus aureus. Nasal examination gave essentially negative results. Roentgenograms showed small frontal sinuses; the left was cloudy, and just above it was an area of osteomyelitis about 1 inch (2.5 cm.) in diameter. Operation was performed through an incision above both eyebrows, at the level of and including the fistulous tract. Necrotic bone was widely removed, exposing granulations on the dura, until normal-appearing bone and healthy dura were encountered. The inner table showed destruction beyond what was evident in the external layer. The left frontal sinus was opened from above, and the inner table, which was necrotic, was removed. The outer wall appeared solid and was not disturbed. The incision was kept open, and the wound was dressed with dichloramine (tolueneparasulfondichloramide) twice daily. Three weeks later the frontal sinus was exposed by an incision through the eyebrow and the floor and remaining portion of the inner table

Fig. 1 (Case 1).—Roentgenogram of a patient operated on seventeen years ago, at which time a large portion of the frontal bone was removed. This shows considerable regeneration.

were removed. Convalescence was uneventful except for some temporary diplopia. The original wound filled in with granulations and finally healed with rather a large scar. No plastic operation was attempted, as she could cover the scar easily with her hair. She has remained well since. She married and moved to California. Through the courtesy of Dr. Hill Hastings I was able to obtain recent roentgenograms of her skull. These show considerable regeneration of bone.

Case 2.—In 1923 a boy of 8 years was examined because of swelling and edema above the eyebrows in the midline following acute frontal sinusitis. Roentgenograms showed small cloudy frontal sinuses, the left being rudimentary. The right was opened externally through the floor, and a drain was left in the incision. No attempt was made to disturb the lining. The temperature, which had been elevated, dropped to normal. In a few days the parents took the child home from the hospital against advice. One month later he returned, complaining of severe headache. There were edema over the forehead and a purulent discharge from the incision, from which Staph. aureus was cultured. Roent-

genograms showed definite osteomyelitis. The frontal bone was exposed by an incision through both eyebrows and across the bridge of the nose. Necrotic bone was found above the frontal sinuses, considerably beyond the area indicated in the roentgenogram. This was removed, exposing dura covered with granulations. Removal was continued until healthy-appearing bone was encountered. The incision was kept open. Three weeks later a Lynch operation was performed on both frontal sinuses. The patient had an uneventful convalescence and except for a depressed scar seemed perfectly well. Eight years later he had acute frontal sinusitis on the left side, which subsided on probing of the sinus and establishment of drainage. I have not seen him since that time, but, as far as I can find at the time of writing, he is well and enjoys a reputation as a semiprofessional football player.

There were considerable procrastination, hesitation and doubt in the management of these cases, perhaps more than is evident from the reports. Edema did not assume the diagnostic significance that it would today. Operation was not done until the roentgenograms gave strongly positive evidence of involvement. It was indeed fortunate that the process in these cases was not especially virulent and that recovery followed one fairly generous removal of bone. This was done with considerable misapprehension as to the final result of the defect. McKenzie's admonition for early and radical operation may have been weakened by the emphasis placed on the differentiation between the discrete, self-limited type of the disease and the diffuse spreading form. At the time the importance of this differentiation seemed to outweigh the necessity for early operation. Munro [2] said: "Actually the pathological process is fundamentally the same, the difference being due to the rapidity and extent of involvement of the venous channels in the diploe, and the resulting variation in the amount of bone destruction."

In the last ten or twelve years the necessity for radical surgical operation in osteomyelitis of the skull has been stressed by a number of writers, including McKenzie,[3] Tobey,[4] Bulson,[5] Woodward,[6] and Wilensky.[7] Munro's studies definitely showed that the chances for recovery are much better with radical treatment than with a more con-

2. Munro, D.: Nontraumatic Osteomyelitis of the Flat Bones of the Skull, Tr. South. S. A. **43**:403, 1930.

3. McKenzie, D.: Further Observations on Spreading Osteomyelitis of the Skull, J. Laryng. & Otol. **42**:293, 1927.

4. Tobey, H. G., in discussion on Imperatori, C. J.: Brain Abscess (Frontal Lobe) Complicating Frontal Sinusitis, Tr. Am. Laryng. A. **49**:34, 1927.

5. Bulson, A. E., Jr.: Osteomyelitis of Frontal Bone as a Complication of Frontal Sinusitis, J. A. M. A. **86**:246 (Jan. 23) 1926.

6. Woodward, F. D.: Osteomyelitis of Skull: Report of Cases Resulting from Frontal Sinus Infection with Staphylococcus, J. A. M. A. **95**:927 (Sept. 27) 1930.

7. Wilensky, A. O.: Association of Osteomyelitis of the Skull and Nasal Accessory Sinus Disease, Arch. Otolaryng. **15**:805 (June) 1932.

servative policy. Certain other writers, including Blair and Brown,[8] were definitely on the conservative side. In 1931 Furstenburg's[9] celebrated paper, based on clinical and pathologic studies in fourteen cases, was read at a meeting of the American Laryngological, Rhinological and Otological Society. He clarified McKenzie's idea of venous extension by postmortem observations of retrograde thrombosis and showed how extradural abscesses, separating the bone from the dura, favor extension of the osteomyelitis. He showed the necessity for radical removal of bone well beyond the obvious limits of the disease and presented evidence that regeneration of bone, previously suggested by McKenzie, is a frequent occurrence and that large portions of the skull can be removed without apprehension. In 1933 Mosher and Judd[10] presented what is probably the outstanding paper of all time on this subject. Based on histopathologic studies, this paper stressed the practical importance of edema as a diagnostic sign and as a guide to the extent of bone to be removed. It defined quantitatively what McKenzie called "the obvious limits of the disease." It showed that the roentgen findings are from seven to ten days late and that the infection is from 1 to 2 inches (2.5 to 5 cm.) beyond the area shown in the roentgenograms. In dramatic terms physicians were admonished to operate early and thoroughly. There were no equivocation and no qualifying statements. An ideal operative technic was outlined. Once the diagnosis is established, there is no place for watchful waiting on the chance that the process will remain self-limited. "Osteomyelitis writes across the patient's brow, not only the diagnosis, but the treatment."

CASE 3.—(Observed in consultation in a neighboring hospital. While all the operations were performed by myself, the patient was not under my direct care until after the operation for osteomyelitis.) A girl of 14 had severe frontal pain, with swelling of the lids of the left eye, after swimming. The temperature ranged between 101 and 102 F. The left middle turbinate was swollen. Roentgenograms showed cloudy left ethmoid sinuses. The sinuses were opened intranasally, and pus was obtained. Four days later there was increased swelling of the eyelid. I was called again, and a Lynch operation was performed. Necrotic bone was found at the inner upper angle of the orbit, and the frontal sinus contained pus. The lining was dark, friable and loosely attached. This was removed as gently as possible. When she was seen again, four days later, there were a

8. Blair, V. P., and Brown, J. B.: Septic Osteomyelitis of the Bones of the Skull and Face: A Plea for Conservative Treatment, Ann. Surg. **85**:1 (Jan.) 1927.

9. Furstenburg, A. C.: Osteomyelitis of the Skull: The Osteogenetic Processes in the Repair of Cranial Defects, Tr. Am. Laryng., Rhin. & Otol. Soc. **37**:1, 1931.

10. Mosher, H. P., and Judd, D. K.: An Analysis of Seven Causes of Osteomyelitis of the Frontal Bone Complicating Frontal Sinusitis, Tr. Am. Laryng., Rhin. & Otol. Soc. **39**:289, 1933.

profuse nasal discharge, slight edema over the eyebrow and a temperature of 104 F. Roentgenograms showed no evidence of osteomyelitis. A revision of the frontal sinus was done, and pus was found retro-orbitally. A rubber drain was inserted, and the incision was left open. The temperature dropped to normal, and she seemed better.

Nine days later there was definite pitting edema, extending over the whole forehead to the hair line. While the roentgenograms still failed to show evidence of osteomyelitis, operation was immediately performed, Mosher's reversed T incision being used. The bone was trephined in an endeavor to get beyond the area of involvement. This necessitated removing bone well back to the coronal suture and laterally into the left temporal fossa. A large epidural abscess was found to the left of the midline. The flaps were sutured back, leaving the field open, and a blood transfusion was given while the patient was on the table. Culture showed a growth of Streptococcus. Repeated cultures confirmed this.

Fig. 2 (case 3).—*A*, large diploic veins in the frontal bone. No roentgenologic evidence of osteomyelitis was present, yet operation revealed involvement almost to the coronal suture, as well as a large epidural abscess. *B*, roentgenogram after operation, showing the extent of removal of bone.

In the first few weeks following operation the patient had several metastatic abscesses on the wrist and the coccyx, followed by pneumonia at the base of the left lung. This cleared, and she seemed to be progressing favorably. Two months after the resection of the frontal bone, she had headache, vomiting and slight facial weakness on the left side. The eyegrounds were reported to be normal on repeated examination. Definite bulging of the dura became apparent. There were ankle clonus and a positive Babinski sign. Abdominal reflexes were abolished. There was incontinence of urine. Operation disclosed a large, fairly well encapsulated abscess of the right frontal lobe. The overlying tissue was coned out with the cutting current, and a Mosher drain was introduced into the abscess cavity. She improved for about a month, and then began to show distinct changes in personality and became aphasic. Bulging was noted in the dura on the left

side. The left frontal lobe was explored, an abscess found and a Mosher drain introduced. She failed rapidly from then on and died two weeks later, fifty days after the first operation for abscess of the brain and one hundred and thirteen days after the resection of the frontal bone.

Permission for postmortem examination could not be obtained. This patient showed leukopenia throughout her illness, the highest white blood cell count at any time being 10,000.

This was a case of streptococcic infection following swimming, in which the osteomyelitic process became well advanced and in which, after it was apparently eliminated, there ensued a sequence of metastatic abscesses, pneumonia and abscess of the brain. The persistently low white blood cell count would seem to indicate a low resistance, yet the patient managed to survive this series of complications for almost five months. Mosher [11] stated that the worst sinus infection and osteomyelitis follow swimming. Several writers, notably McKenzie and Woodward, have stated that streptococcic infection is apt to result fatally. In Williams and Heilman's [12] recent paper they suggested from the findings in two cases that an anaerobic streptococcus may be the causative agent of this lesion. One obvious handicap in the management of my case was the fact that the patient was in another hospital and not under my personal observation and control at all times. The magnitude of the problem inherent in these cases makes any attempt at handling them, except under the most favorable circumstances, prohibitive. In reviewing the case, it would seem that draining the frontal sinus externally without closure at the onset would have been preferable. Primary closure of the incision in the frontal sinus may be a factor in the development of osteomyelitis. Undoubtedly the frontal bone could well have been resected earlier, as there was marked edema well to the hair line when this was done. When it was removed, it was removed radically, well beyond the limits of involvement, and there were no signs of recurrence of the osteomyelitis. Whether the abscess of the right frontal lobe was not completely drained and itself invaded the left lobe or whether this later manifestation was a second abscess is debatable. The virulence of the infection and the persistently low resistance of the patient are factors which must be kept in mind.

CASE 4.—This patient was a woman of 30, poorly developed and nourished, who had been admitted to the hospital on July 21, 1936, in the ophthalmologic service of Dr. H. F. Hill, with a diagnosis of orbital abscess. Examination at this time, according to the hospital records, showed: "marked redness and swelling of both lids, definite proptosis, limited muscular movement and pupils 4 mm.

11. Mosher, H. P.: Osteomyelitis of the Frontal Bone, J. A. M. A. **107**:942 (Sept. 19) 1936.

12. Williams, H. L., and Heilman, F. R.: Spreading Osteomyelitis of the Frontal Bone Secondary to Disease of the Frontal Sinus, Arch. Otolaryng. **25**: 196 (Feb.) 1937.

in diameter and not reacting. The vitreous was hazy, and the nerve head was just visible as a hazy blurred area. There were no vision and no perception of light." The Kahn and Hinton tests gave negative results. Exploration of the orbit revealed considerable brawny induration but no pus. Roentgenograms of the skull at that time showed no involvement. She was extremely ill for some time, the temperature ranging between 101 and 102 F. Spinal puncture yielded normal fluid.

Apparently the patient was making a slow convalescence. The temperature had been normal for several days, when there was a sudden rise to 102 F. She was seen by Dr. T. E. Hardy, of the medical service, who noted an area of pitting edema in the left temporal region, extending from the zygomatic arch upward onto the scalp. He made a tentative diagnosis of osteomyelitis. She was then transferred to my service. Roentgenograms showed a well defined area of mottled osteomyelitis involving the temporal fossa. With the patient under anesthesia with tribromethanol in amylene hydrate a circular flap was made with the base down, somewhat similar to that used for a subtemporal decompression. The bone of the temporal fossa was completely necrotic, and pus and granulations were found coming from the orbit. Her condition precluded the ideal method of working from above downward; so it was necessary to remove the diseased bone as rapidly as possible, outward from the necrotic area. The dura was covered with granulations. Removal of bone was continued well beyond the diseased area. As is usual in these cases, there was considerable loss of blood. Two wide strips of Penrose rubber tubing were laid over the dura horizontally, and the extreme upper edge of the circular flap was sutured in place. This left a large tunnel extending from before backward separating the dura and the periosteum. She was given a blood transfusion. Culture showed a growth of Staph. aureus. The dressings were changed twice daily in an endeavor to keep the tunnel free and draining. She made a slow but uneventful convalescence from that time on. The flap healed without the necessity of a secondary plastic operation and with little deformity. She was discharged from the hospital on October 9, forty-two days after the operation. She has been under observation since and has shown no signs of recurrence at the time of writing.

In this case the osteomyelitis was secondary to an orbital abscess. In Munro's study of two hundred and twenty-one cases, in ten the condition was of this origin. Possibly a more successful exploration of the orbit in the first days of her illness might have obviated the infection of the bone. Mosher has called attention to the extreme vulnerability of the external angle and the temporal fossa of the frontal bone. This is well illustrated in this case. The type of incision may be open to criticism. It was selected because of a desire to avoid cutting the temporal artery and to save as much as possible of the blood supply of the scalp. The wide tunnel of tubing worked well in this case, although I was prepared to discard it, turning the flap well back, had the postoperative course indicated it. As it was, a secondary plastic operation was avoided and the patient was able to be discharged in a fairly short time. While I was not familiar with their experience at that time, Williams and Heilman described a somewhat similar flap in their recent publication.

In these two cases the diagnosis was made mainly on the basis of edema, although the last patient showed positive roentgen findings when I first saw her. Operation was performed immediately, without hesitation, once the diagnosis was made and was carried out radically, with wide resection of bone. Although the first patient died, apparently the osteomyelitic process had been eliminated. Blood transfusions were used in both cases postoperatively. The use of bacterio-

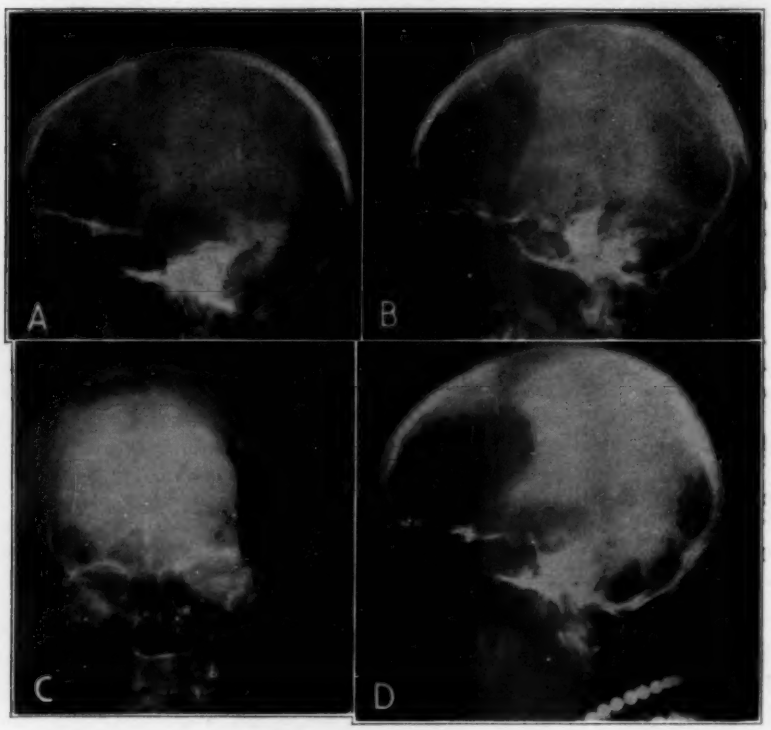

Fig. 3 (case 4).—*A*, roentgenogram showing osteomyelitis, secondary to orbital abscess and having its inception in the temporal fossa. *B*, roentgenogram after operation, showing the extent of removal of bone. *C*, anteroposterior view of the same patient. *D*, roentgenogram nine months after operation, showing beginning regeneration of bone. The patient was perfectly well, with little deformity.

phage was considered in the last case, but the patient did so well with simple sterile dressings changed frequently that it was not resorted to.

In such a condition as osteomyelitis of the skull, any change in attitude on the part of the operator in such a fourteen year period must reflect the influence of the literature rather than of personal experience. My own reactions to the literature of the time, as sum-

marized in McKenzie's paper, perhaps because of imperfect understanding or insufficient study, were such that many of the important points were definitely overshadowed by the necessity for differentiation between the types of the disease. This seemed to be the first consideration. It is still emphasized in many later contributions by other writers. If it is a matter of degree of activity, based to a certain extent on the virulence of the infection and the resistance, age and type of bone of the patient, it would seem most important after a diagnosis of osteomyelitis is made to recognize the possibilities of diffusion early, rather than spend time and mental effort on differentiation of types. Furstenburg has shown that spongy bone may be found in both the anterior and the posterior wall of the frontal sinus, in close proximity to the lining membrane. Young persons have more diploic bone than do older persons. This predisposes to diffusion of the process. If one keeps the possibilities of extension by retrograde thrombosis in mind, the appearance of edema, sepsis of varying degree and headache in the presence of suppurative sinusitis certainly calls for immediate action rather than watchful waiting.

The literature of the last few years, especially the papers of Mosher and of Furstenburg, has greatly facilitated the management of osteomyelitis of the skull. Diagnosis is made easier, and proper treatment is indicated in definite terms. The significance of edema, the relative lateness of positive roentgen findings and the necessity for immediate and radical operation have been stressed in a most impressive manner. The value of this is most obvious. It makes for confidence and for early decision, rather than for procrastination and doubt. While the activity of the process may vary, depending on the virulence of the infecting organism and the resistance and age of the patient so as to make possible, at times, a limited, sequestrating form of the disease; in the vast majority of cases, unless the chronic form is obvious, it would seem good judgment to operate radically, as soon as the diagnosis is established, especially in the younger patient.

SUMMARY

An attempt is made to show the value of outstanding papers on the management of certain conditions in which, because of meager personal experience, physicians are especially dependent on the literature. This is illustrated by the reports of four cases of osteomyelitis of the frontal bone, one occurring seventeen and one fourteen years ago, and two within the past two years, contrasting the two groups. As a result of certain papers, notably those of Mosher and of Furstenburg, the management of osteomyelitis of the skull has been greatly facilitated.

PROGNOSIS IN LARYNGEAL TUBERCULOSIS

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The prognosis in tuberculosis of the larynx has decidedly improved since Sir Morrell Mackenzie [1] in 1880 made the statement so often quoted that "the prognosis of laryngeal tuberculosis is always extremely unfavorable and it is not certain that any cases ever recover." Search of the French and German literature of that era revealed the prognosis to be equally hopeless. Sir St. Clair Thomson [2] in 1924 said: "A Group I patient (that is a slight case) with a laryngeal lesion has a worse prospect than a Group II case with a sound larynx. And a Group II case (that is a severe case) with throat trouble has a gloomier expectation than if he had a healthy larynx, but lungs so involved as to be classed in Group III (that is an 'advanced' case). Differently expressed, the discovery of a laryngeal lesion at once moves a case down to a lower group." Although this high authority sounded a less hopeless note than was expressed a generation before, it indicates that tuberculosis of the larynx was still regarded as a serious complication of the pulmonary disease. However, since that time (1924) a notable advance has been made in three directions in treatment—more prolonged rest in bed, surgical operation on the chest (including pneumothorax) and earlier and more general application of electrocautery. In making a prognosis it is all important that one make not only a thorough examination of the larynx but also an accurate physical examination of the chest, including stereoscopic roentgenograms. The sedimentation rate should be taken, for it is now regarded as a fair measure of the patient's resistance to the infection.

Levy [3] rightly said: "I know of no disease into the prognosis of which so many factors enter as into that of laryngeal tuberculosis." It is desirable to make a fairly accurate prognosis for the reason that the whole method of treatment may be determined by the patient's

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Read at the Fifty-Ninth Annual Congress of the American Laryngological Association, Atlantic City, N. J., May 31, 1937.

1. Mackenzie, Morrell: Diseases of Throat and Nose, London, J. & A. Churchill, 1880, vol. 1, p. 383.

2. Thomson, St. Clair: The Mitchell Lecture on Tuberculosis, Brit. M. J. **2**:841 (Nov. 8) 1924

3. Levy, Robert: Laryngeal Tuberculosis, J. A. M. A. **60**:1518-1523 (May 17) 1913.

chance of a cure or an arrest of his pulmonary condition. It would be obviously unwise to attempt to effect a cure of the laryngeal complication if the pulmonary condition has advanced to the stage at which an early termination can be expected. This does not preclude the use of any necessary measures for the relief of pain, which is so frequent a symptom of this disease. There is also an economic and social side—patients who are hopelessly diseased should be spared the financial burden of remaining in a sanatorium which separates them from relatives and friends. However, there are cases, particularly when there are children in the home, in which it may be wise from a preventive standpoint for the patient to continue treatment in a sanatorium. In discussing prognosis I shall refer to diagnosis and treatment only so far as they affect the outcome of the disease.

As to early diagnosis, Looper [4] wisely said: "Too much cannot be said about the importance of early diagnosis in these cases, for intrinsic lesions respond readily to treatment and cases can be effectively cured." It is my belief that local treatment has an important bearing on the outcome both from a laryngeal and from a pulmonary standpoint, and due emphasis will be placed on this later.

It is worthy of note that the mortality from tuberculosis has been reduced to about one-third of what it was thirty years ago, and it is not unreasonable to suppose that the morbidity has been reduced in a corresponding ratio, with a still greater reduction in the occurrence of the laryngeal complication. This great reduction in mortality is due to several factors, among them an intensive educational program carried on in the way of prevention, isolation of patients in sanatoriums during the infectious stage and advances made in their medical and surgical care. The improvement in the social and economic status of the people, particularly in the hours of labor, has undoubtedly played a part in lessening the incidence of this dread disease. It is thought by some that an increase in immunity has been built up by the present generation. Physicians can claim a measure of credit for stressing the importance of early diagnosis and also the practice of preventive measures by encouraging routine examination of school children in order to discover the presence of this disease in a latent stage existing as childhood tuberculosis. Full credit should also be given the veterinary profession for their aid in the eradication of bovine tuberculosis from dairy herds. There has also been a more general use of pasteurized milk.

The change in the attitude of physicians toward this important complication has made for a better prognosis, for those who specialize in

4. Looper, Edward A.: Tr. Am. Laryng., Rhin. & Otol. Soc., 1926, p. 78.

pulmonary tuberculosis no longer advise that the larynx be left severely alone, with the statement that it will improve as the pulmonary condition advances toward recovery. As Sir St. Clair Thomson [2] said: "A larynx may improve or get well while the lung disease remains quiescent or gets worse, but if the disease in the larynx advances the pulmonary disease cannot possibly become arrested and soon makes progress." Levy,[5] discussing prognosis, said: "The relation between pulmonary and laryngeal tuberculosis must be considered from two standpoints; namely, the influence the laryngeal involvement has upon the pulmonary and that of the pulmonary disease upon the progress of the laryngeal complication."

It cannot be questioned that the situation and the type of the lesion of the larynx have an important bearing on the prognosis. Lesions situated on the posterior commissure or on the vocal chords offer the most favorable prognosis, and fortunately these are the situations in which the lesion is most frequently encountered. In tuberculosis, as in cancer, the intrinsic lesions in these locations offer a more favorable prognosis than those which appear on the epiglottis, the aryo-epiglottic folds or the arytenoid cartilages. The unfavorable prognosis in these cases is due not only to the more painful nature of the lesion, which interferes with nutrition, but to the difference in the type of tissue involved. Four types of laryngeal lesion are recognized—infiltration, ulceration, perichondritis and tuberculoma. It is obvious that these types often merge into each other. Pseudo-edema is noted at times, involving chiefly the arytenoid cartilages and the epiglottis. This type of lesion is usually painful and from its very nature adds to the gravity of the prognosis. Multiple lesions of the larynx are more serious than those in which the tubercle appears at a single site. For instance, a tuberculous process appearing on both sides of the larynx is more serious than a lesion confined to one side. Perichondritis of the epiglottis or the arytenoid cartilages offers an unfavorable prognosis, and when a pale edematous swelling in this region is noted the prognosis becomes well nigh hopeless. It is thought that this type of lesion is often due to an infection of the blood stream, as distinguished from the intrinsic lesions, which are believed to arise from contact with sputum. It is well to bear in mind that there is a strong tendency for the lesion in the larynx to be of the same type as that found in the lungs; that is, when there is an exudative type of involvement in the lung, one can expect an ulcerative type in the larynx, and when there is a fibrotic type in the lungs, there is likely to be fibrosis in the larynx, with healing tendencies. To this, however, there are many exceptions.

5. Levy, Robert: Prognosis of Laryngeal Tuberculosis, Laryngoscope **14**: 787-790, 1904.

As to age, it has often been observed that the young bear this disease badly, particularly in the second and third decades. Fortunately, this complication is not found in the first decade and is infrequent in the second. This apparent immunity in the early years of life is probably due to the failure to produce sputum. Sex seems to have no influence on the prognosis, except that pregnancy adds to the gravity. Tuberculosis of the middle ear or the tongue adds somewhat to the gravity of the condition, for this indicates a poor resistance to the infection.

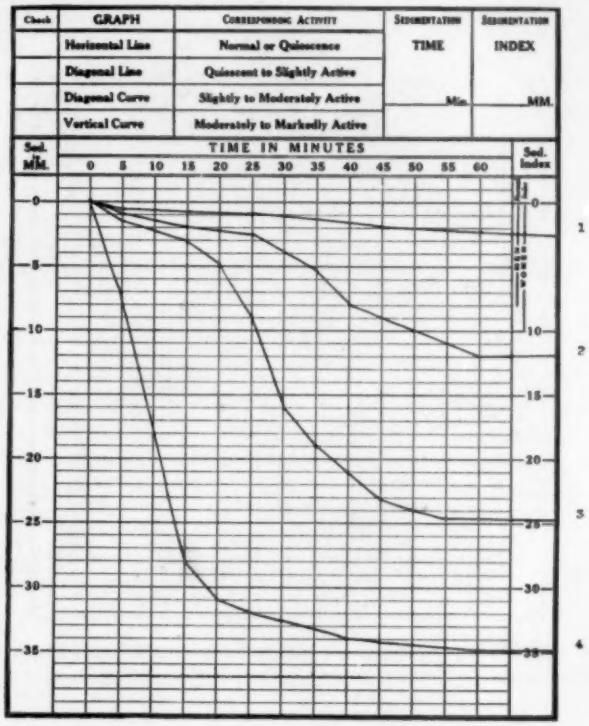

Fig. 1.—Four types of sedimentation curve (Cutler).

If the complication in the larynx is associated with a similar lesion in the pharynx, genito-urinary region or intestinal tract, the prognosis may well be considered grave. It would be needless to say that any severe complicating disease, such as diabetes, nephritis or syphilis, makes the prognosis more unfavorable. Just as physicians have noted that the local condition in the larynx affects the pulmonary and general condition, the reverse of this is true. Therefore, when a patient with a laryngeal complication is observed to be on the down grade, as evidenced by loss of weight, rise of temperature, increase of thoracic

signs confirmed by roentgen findings and a rapid rate of sedimentation, one cannot make other than an unfavorable prognosis.

The sedimentation rate influenced by both the pulmonary and the laryngeal condition is a fair measure of tissue resistance, as I shall attempt to show by slides. Ringer[6] said: "No definite proof of the cause of increased sedimentation rate has been brought forth, but it is being generally accepted that the phenomenon depends upon the amount of cellular destruction going on in the body. In the ordinary wear and tear of life there is constantly present a process of tissue destruction accompanied by a similar amount of tissue repair." To

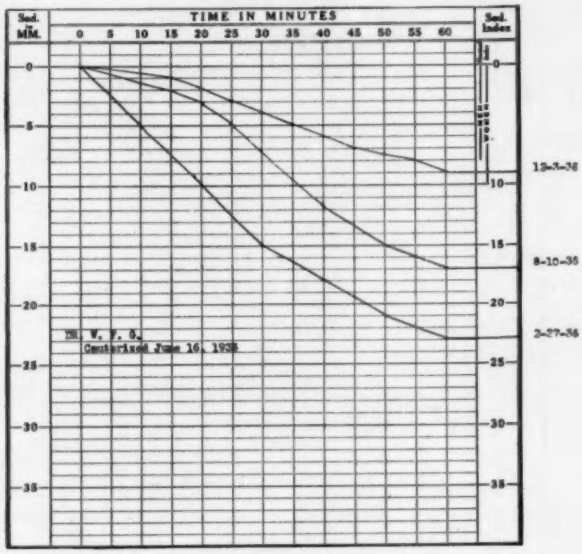

Fig. 2.—Improvement of sedimentation rate following cauterization of the posterior commissure.

quote Cutler: "Should the amount of tissue destruction pass beyond the normal then the stability of the blood is seriously disturbed and the red blood cells settle out quickly from the plasma . . . Regardless of the disease present; whether it be active pulmonary tuberculosis, malignancy, pelvic inflammatory disease, an accute infection such as typhoid fever, or any disease in which tissue destruction is going on at a greater pace than normal, the rapidity of settling of the red blood cells is in direct proportion to the severity of the disease." Videbech stressed the value also of the leukocytic index in prognosis, but the

6. Ringer, Paul, and Roach, Mary: Blood Sedimentation Test, Ann. Int. Med. **8**:258-267 (Sept.) 1934.

simplicity of determination of the sedimentation rate makes it lend itself more readily to practical clinical use.

Patients taking treatment in a well regulated sanatorium where rest in bed and rest of the voice can be enforced have a better chance for recovery than those in a private home or a general hospital. Sir St. Clair Thomson has observed that patients acquiring a laryngeal complication while under treatment at a sanatorium do not offer a favorable prognosis. It has been observed by many, notably Dworetzky,[7] that artificial pneumothorax exerts a favorable influence on the lesion in the larynx by lessening cough and expectoration and raising the

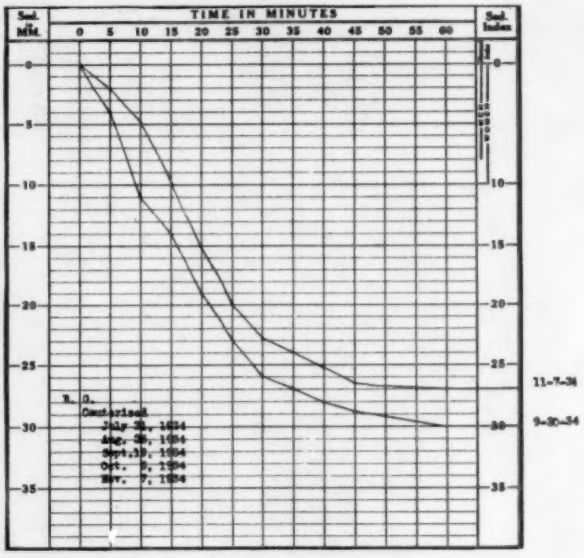

Fig. 3.—Extensive ulceration of the epiglottis and arytenoid cartilages. Slight improvement in the sedimentation rate followed cauterization.

resistance of the body. Thoracoplasty performed in well selected cases can be expected to exert a similar favorable influence.

It can hardly be questioned that the removal of diseased tonsils causing severe systemic disturbance often proves to be of the greatest benefit to patients suffering from chronic inactive tuberculosis of the lungs. However, in the presence of a laryngeal lesion the removal of the tonsils is fraught with the greatest danger. Even though there is no active lesion in the larynx, the possibility of extension from the pharynx should be borne in mind before one enters on a tonsillectomy. Wood

7. Dworetzky, J. P.: Lung Immobilization in the Treatment of Pulmonary Tuberculosis and Its Influence on the Larynx, Ann. Otol., Rhin. & Laryng. **39**: 1111-1124 (Dec.) 1930.

expressed strong opposition to surgical operations on the tonsils, save cautery, in practically any stage of pulmonary tuberculosis. Newhart [8] and his associates stated: "With a careful selection of patients, with the proper preoperative and postoperative care, and with good surgical technic the tuberculosis patient is at least as good a surgical risk as the average ambulatory case." I am of the opinion that the infection which at times takes place in the fossa after the operation results from the spread from infection in the tonsil itself rather than from contact with sputum. Rarely, active tuberculosis of the tonsil is present, evidenced by grayish ulceration and at times by the appearance of sub-

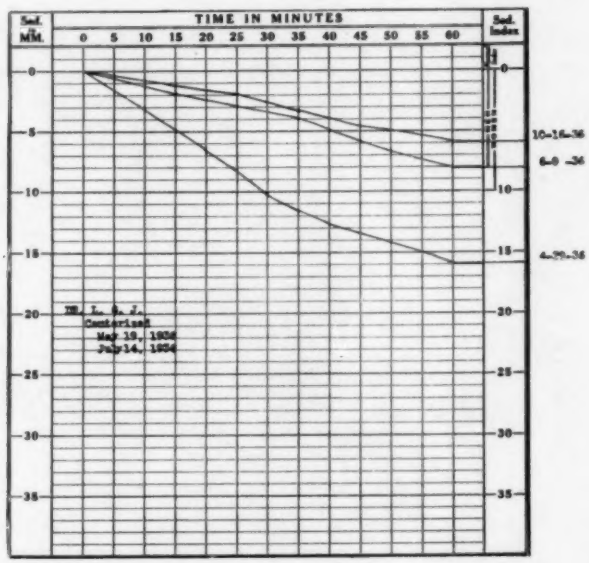

Fig. 4.—Superficial ulceration of the epiglottis. Marked improvement followed rest in bed and cauterization. The patient made a good recovery.

epithelial tubercles. Patients with such a condition are obviously not suited for removal of the tonsils but do respond to the action of cautery punctures applied at intervals of several weeks. A high percentage of tonsils become infected in pulmonary tuberculosis, the infection, fortunately remaining latent so long as the general condition of the patient keeps good and the sedimentation rate remains low. No patient complaining of persistent sore throat or hoarseness should have his tonsils removed till an examination has been made of the larynx. It

8. Newhart, H.; Cohen, S. S., and VanWinkle, C. C.: Tonsillectomy in Tuberculosis: Incidence and Pathology of Tuberculosis of Tonsils in Adults, Ann. Otol., Rhin. & Laryng. **43**:769-778 (Sept.) 1934.

has been my misfortune to observe too many cases of pharyngeal tuberculosis resulting from ill advised tonsillectomy.

As there is a close dependence of the general and the pulmonary condition on the complication in the larynx, particularly when pain is present, it becomes necessary to speak briefly of treatment as influencing the prognosis. There are cases in which the outcome depends on appropriate laryngeal treatment, and for this purpose the value of the electrocautery and of silence overshadows that of all other types of treatment. I shall not enter into discussion of other therapeutic measures. Thomson said: "It is the treatment for ease and for cures." Spencer [9]

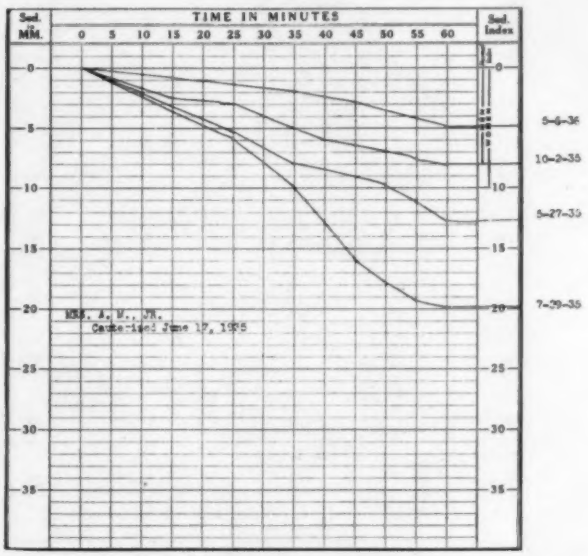

Fig. 5.—Tuberculous infiltration on the inner side of the left arytenoid cartilage. Marked improvement in sedimentation rate followed cauterization.

said: "It is doubtful if any single method of treatment has yielded better results than the cautery." Physicians in America are indebted to George Wood for the introduction of the electrocautery treatment first used in Berlin by Gruenwald [10] (1905). In 1910 Wood [11] made valuable animal experiments proving the healing action of the electro-

9. Spencer, Frank R.: Laryngeal Tuberculosis, Philadelphia, J. B. Lippincott Company, 1927, p. 46.

10. Gruenwald, L.: Some Observations on the Treatment of Laryngeal Tuberculosis, J. Laryng. **20**:637-644, 1905.

11. Wood, George B.: Actual Cautery in Localized Tuberculous Lesions of the Larynx, Tr. Am. Laryng. A., 1911, p. 181.

cautery. His [12] enthusiasm for this type of therapy was aptly expressed in these words: "It is undoubtedly the method *par excellence* for the treatment of laryngeal tuberculosis, and its use brings to the surgeon that peculiar sense of elation which he feels when, through his interference, suffering and death have been averted." In my opinion there are few contraindications for the use of the cautery. It is not advisable when hyperemia alone is present and the site of the offending tubercles cannot be determined. Rest of the voice carried out in the hygienic surroundings of a sanatorium is frequently all that is required. It is obvious that for patients with advanced lesions of the larynx associated with

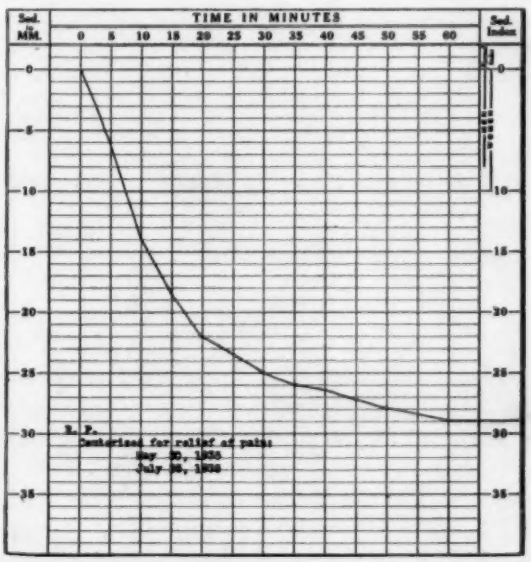

Fig. 6.—Ulceration in the lower tonsillar fossa. Biopsy was performed for diagnosis and a tubercle was found, which spread to the epiglottis and the aryepiglottic fold. Cauterization was done for relief of pain. The sedimentation rate was high. Death occurred on September 10.

severe constitutional symptoms cautery should be withheld except for the relief of pain. It is in such cases that the sedimentation rate may be the deciding factor in determining the advisability of the use of the cautery.

In conclusion, it would seem worth while to speak briefly of the possible danger of section of tuberculous lesions of the larynx. Much has been written relating to the danger of biopsy in cancer of this region, but little emphasis has been laid on the danger of extension

12. Wood, George B.: Use of Electric Cautery in Laryngeal Tuberculosis, Am. J. M. Sc. **163**:854-858 (June) 1922.

following this procedure when tubercles are present. It is thought that the infection spreads in the larynx by way of the lymphatics. Wood [13] quoted Manassa as describing a thrombosed condition of the lymphatics in the inflammatory area surrounding the active tuberculous lesion of the larynx. He (Manassa) expressed the belief that this area is susceptible to infection and that these findings suggest that the lymphatics serve as a pathway for extension of tuberculous disease. This means not that the primary infection of the larynx comes through the lymph vessels, but only that the spread of the disease inside of the larynx takes place in this way. Wood said: "This observation of Manassa is

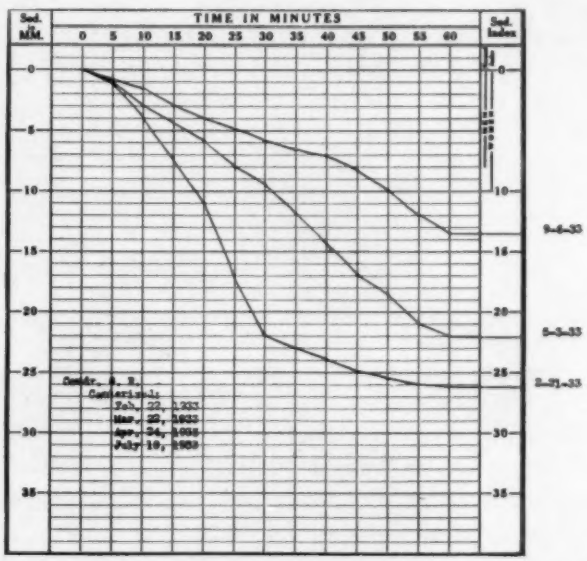

Fig. 7.—Much swelling of the left arytenoid cartilage with infiltration of the posterior end of the left vocal cord. Cauterization was done on four occasions; the sedimentation rate improved, and good recovery followed.

extremely important although from clinical experience such a method of spread of the disease in the larynx was thought possible. The pathologic proof ought to make one even more careful in avoiding 'intralaryngeal manipulation' that might tend to force bacilli through the tissue." Cases have come under my observation in which the condition was undoubtedly made worse after section of the larynx when the history, thoracic findings and appearance of the lesion pointed the way to a diagnosis of laryngeal tuberculosis. On the other hand, I realize that in certain cases of frank pulmonary tuberculosis there may occur a

13. Wood, George B.: Laryngeal Tuberculosis, Arch. Otolaryng. **8**:720-728 (Dec.) 1928.

type of lesion in the larynx in which only a microscopic section will determine the diagnosis between cancer and tubercle. However, the occurrence of these doubtful cases should be infrequent. When necessity for this procedure does arise, I agree with Schuster,[14] who advised the sealing of the raw surface with the cautery.

Without my attempting to summarize the advances made in the handling of this still serious condition, I think that those who have been engaged in the work for a generation will agree with me that physicians now enter on the treatment of laryngeal tuberculosis with an entirely different and more hopeful attitude.

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14. Schuster, Franklin P.: Observations on the Larynx in the Tuberculous, Arch. Otolaryng. **25**:23-36 (Jan.) 1937.

CHOLESTEATOMA OF THE FRONTAL SINUS

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PHILADELPHIA

Ewing,[1] in discussing tumors of the hypophysis, said that cholesteatoma as well as the true dermoid containing hair and sebaceous material occasionally appears in or near the sella turcica. He intimated that it may take its origin from ectodermal rests carried in with the closure of the vesicles of the brain. In some instances such a so-called tumor may have developed by metaplasia from remnants of the hypophysial duct. Fetal implantation may account for these teratomas of the brain, in which class Ewing seems to have been inclined to place cholesteatoma found in this region. A teratoid tumor at the base of the skull is commonly referred to as buccal ectoderm misplaced in the development of the hypophysis. Ewing stated:

> The relation of the medullary groove to the ectoderm, the complex step in the formation of the brain and ventricles, and the formation and union of the cranial bones give abundant sources for the development of epidermal growths in the skull. The interpretation of these tumors is further complicated by certain properties of endothelial growth to copy the structure of cholesteatoma, and, finally, traumatic implantation of portions of ectoderm accounts for a small proportion of these intracranial processes.

Ewing described a cholesteatoma as a tumor composed of lamellated waxy or scaly material enclosed in a wall of stratified squamous cells. He quoted Bostroem as concluding that cholesteatoma always arises from embroynal epidermal inclusion. In the case of a cholesteatoma of the frontal sinus reported by Hartley, which seems to be unique, a traumatic origin is supposed. In the case of a dural dermoid lying, as it usually does, close to the skull, there is often a definite connection with the skin by an epithelial canal or a fibrous strand, frequently through a dehiscence of bone and with a bald spot on the corresponding portion of the scalp. Such a tumor must, therefore, it is concluded, arise late, after the skin has formed.

McFarland[2] stated that J. Müller, who originated the name cholesteatoma, first described these "laminated fatty tumors" as having

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Read at the Fifty-Ninth Annual Congress of the American Laryngological Association, Atlantic City, N. J., June 1, 1937.

1. Ewing, James: Neoplastic Diseases, ed. 3, Philadelphia, W. B. Saunders Company, 1928.

2. McFarland, Joseph: Surgical Pathology, Philadelphia, P. Blakiston's Son & Co., 1924.

a dull pearl-like luster and as being composed of "delicate polyhedral cells arranged in concentric lamina between which crystalline fat was deposited. The cells were mutually compressed, pale, clear and anuclear . . . Virchow thought that true cholesteatoma arises through multiplication and concentric lamination of epithelial cells." Virchow seemed to think that the cholesterol is a subordinate feature, although usually plates of cholesterol are found between the layers. He expressed the belief that these cells arise through metaplasia of the connective tissue, even though he recognized them as epithelial. If they arise from embryonal inclusion of epidermis, the cells will be epithelial and epidermal.

McFarland, in speaking of cholesteatoma of the ear (middle), attributed it to embryonal inclusion of "epidermal cells attending the closure of the first visceral furrow, which is followed by desquamation and massive accumulation of the cells which become compressed into concentric masses, and later infiltrated with cholesterin." That is definitely not descriptive of a tumor, certainly not of a neoplasm. These masses finally enlarge to the point of rupture through the tympanic membrane, where the appearance, with secondary infection, is that of chronic suppurative otitis media or mastoiditis. Then the cells appear as old and hornified, without nuclei, so that identification is difficult. This conception, as outlined from McFarland, is different from the otologic conception of cholesteatoma of the middle ear and the mastoid. Otologically, it has long been thought that the cholesteatoma is caused by ingrowth of epidermis from the external auditory canal through a marginal perforation of the drum to line the infected spaces of the tympanum and mastoid, replacing diseased mucous membrane. Desquamation takes place, and when the discharge of the desquamated cells is obstructed, as for instance in the aditus, accumulation and lamination occur, with the deposit of cholesterol crystals. Pressure of the accumulating mass tends to extend the boundaries of the original cavity invaded by absorption of bone or pressure necrosis, and the mass becomes infected by bacteria gaining entrance from the originally infected mucous membrane; hence the foul odor of decomposition usually, but not always, associated with this process. The appearance is similar to that of a cholesteatoma formed by embryonal inclusion or by metaplasia and is familiar to every otologist, for it is a condition frequently seen. Its characteristics are the laminated arrangement of the cells, mostly decomposed, the cholesterol crystals, the foul odor and the matrix from which the desquamation takes place, which is simply the ingrowing layer of epithelium.

In this report of a case of apparently true cholesteatoma of the frontal sinus, the chief points of interest would seem to be its rarity—for only one other case could be found and in that case the condition was probably of traumatic origin—and the probable origin of a condition of this type. None of the clinicians with whom I talked had observed a similar case, and the pathologists, while admitting this lesion was a true cholesteatoma, could suggest no other origin than a possible embryonal inclusion (which would put it in the general classification of dermoid or teratoma), traumatic inclusion or metaplasia. The pathologists seem to think that this explanation is not altogether unlikely and the condition is analogous to the metaplasia of tumors in other parts of the body. If so, it would probably take place owing to the irritation of chronic infection, which may have been present in the case reported; but if the lesion is produced in this way, why in the countless infections of the frontal sinus has it not been more frequently observed, as it is in the ear? Traumatic origin in this case may probably be ruled out by the history and the lack of any scar. The otolaryngologist thinks immediately of the process by which the epidermis invades the middle ear and the mastoid and seeks an analogous explanation, but in the ear conditions are different. From the skin of the external auditory canal, the epidermis passes inward through the perforation in the drum to replace the mucosa, and a continuous line of epidermal cells is present. In the case of the frontal sinus, if this reasoning held good, the epidermal invasion would have to start at the nasal vestibule and traverse the entire mucosal tract of the nasal chamber to and through the nasofrontal duct to the sinus, where if the implantation was successful desquamation and accumulation could proceed as in the aural condition. In doing this, however, it would seem that some trace of this invasion would remain in the nasal chamber, as shown by some change in the nasal mucosa. Such change was not observable.

There remains, then, the theory of fetal inclusion; and possibly this is the most satisfactory explanation after all. The inclusion must evidently be held causative for cholesteatoma found within the cranial cavity, so why not for cholesteatoma between the tables of the skull in the frontal sinus?

Rhinitis caseosa, a rare nasal condition having a somewhat similar symptomatology and pathologic picture, may easily be confused with cholesteatoma and may, indeed, be identical. This condition has recently been described by Myersberg, Bernstein and Mezz [3] in an excellent article, with a report of a case, said to be the only one in the American literature.

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3. Meyersberg, H.; Bernstein, P., and Mezz, D.: Rhinitis Caseosa: Analysis of Literature and Report of a Case, Arch. Otolaryng. **23**:449 (April) 1936.

Since it was first described and named by Duplay in 1874, reports of cases and theories as to etiology have appeared from time to time in the European literature. While the symptomatology seems to be definitely established, the etiology is still much in doubt, except that the condition apparently accompanies suppurative disease of the sinuses. It has been called cholesteatoma, but there seem to be some apparently essential differences in the pathologic picture. It consists of a foul-smelling collection of flaky material, later forming a pultaceous, putty-like or cheesy amorphous mass in the nasal chambers and accessory cavities, which is easily removed, leaving a more or less normal mucosal lining. When the disease has been present for a long time, erosion of bone, with enlargement of the cavities, may take place, resulting in deformity of the parts or production of fistulous tracts. Different varieties of micro-organisms have been found present, but none has been thought to be the causative factor.

Skillern,[4] in 1921, reported a case of infection of the maxillary sinus, the description of which tallies with that usually ascribed to rhinitis caseosa, in which the infective agent was an aspergillus.

While some authors have attempted to identify rhinitis caseosa with cholesteatoma and while the symptoms often appear to be similar, the latter has certain characteristics thought to be diagnostic that are not found in the former. These are the basement membrane, or matrix, of squamous epithelium, the concentric arrangement of the desquamated cells and the presence of platelets of cholesterol between the layers. This contrasts with cylinder epithelial cells seen beneath the cheeselike masses of rhinitis caseosa and the amorphous character of the mass itself. If this distinction between the two diseases (if they are two) holds good, the case about to be reported would seem to be an instance of cholesteatoma, whatever its origin may have been, the various possibilities of which are discussed earlier in this paper.

One other possibility remains—traumatism. There was a history of a sledding accident thirty-five years before the patient came to the hospital, in which he sustained a deep wound between the left eye and the nose. The scar from this wound was not evident, but it is possible that at that time a piece of epidermis was displaced into the left frontal sinus or that a fistulous opening remained for a long enough period to permit some epidermization of the frontal sinus cavity, as in analogous cases of involvement of the mastoid. I think this possibility cannot be entirely ruled out, although the meager history of the accident does not specifically confirm it.

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4. Skillern, Ross Hall: Aspergillosis of the Maxillary Sinus, Tr. Am. Laryng. A. **43**:180, 1921.

REPORT OF A CASE

DeW. M., a white man 51 years of age, was a truck driver. His previous history was without interest, with the following exception: At the age of 16, thirty-five years before he was examined, he was injured in a sledding accident, suffering a rather deep cut somewhere between the nose and the left eye, which displaced the eye downward and outward. From that time onward, he had left external strabismus, with diplopia when he was not wearing corrective glasses. While he was in the United States Army during the World War, this condition was aggravated because he did not wear glasses, but it was not essentially changed. Since 1917 and 1918 he had had repeated attacks of swelling, redness and pain in or about the left eye, which he attributed to a cold. This happened several times a year. He had been receiving compensation from the government for this since the war. Dr. Franklin stated that to his knowledge the patient had had some proptosis and swelling of the upper lid from time to time during the last sixteen years. He had not been subject to head colds, nasal discharge or headache.

The patient was first seen by me on Feb. 27, 1936, having been referred by his ophthalmologist, Col. C. P. Franklin, with the following history: For the last three weeks he had had a head cold, characterized chiefly by postnasal discharge. On February 18 he drove his truck through a hail storm with his head out of the window because of a frosted wind-shield. Six hours later there was sudden swelling of the upper left eyelid, with some pain. This received conservative treatment and fluctuated somewhat in size.

When he was first examined by me, the left eye was closed by edematous swelling of the upper lid and the soft tissues of the eyebrow and forehead. There was not much pain but some tenderness. The left eye was proptosed downward and outward, but the globe, as well as vision, appeared normal. Movements of the eyeball were markedly interfered with. The patient had had an occasional chill, with fever and frontal headache in the last few days. Little more of interest was found by examination. The nose was practically normal, only slight hyperplasia of the left middle turbinate, submerged and infected tonsils and some carious teeth being noted.

On February 28, the patient was referred to my dispensary in the Graduate Hospital, where Dr. Edmund Spaeth was asked for an ophthalmologic consultation. A diagnosis of retrobulbar abscess was made, and the patient was admitted to Dr. Luther Peter's ophthalmologic service. Roentgen ray examination by Dr. Karl Kornblum was reported as follows:

"There is a large cranial defect, approximately 4 cm. in diameter, in the left frontal region. This involves the frontal bone, the superior border of the orbit, the anterior part of the roof of the orbit and also the left frontal sinus. Within this defect there is a shadow of irregular calcification, which may be due to regeneration of osseous tissue or to a calcified plaque on the dura. The left frontal sinus shows a marked opacity, possibly due to a recent infection. The left maxillary sinus shows evidence of chronic thickening of the mucous membrane."

Immediately on admission the orbital abscess was drained by Dr. Spaeth by an incision through the upper lid. About 1 ounce (30 cc.) of yellow-green pus was evacuated. The abscess extended deeply behind the bulb. There was a fistulous opening into the left frontal sinus through the orbital ridge, the bone of which appeared to be necrotic and movable. A culture, which later was reported as showing Staphylococcus albus-haemolyticus, was taken, and a fragment of bone from the floor of the frontal sinus was sent to the laboratory. The report on this

was as follows: "Sections from this tissue showed fragments of bone and fibrous tissue. In the latter there was a 'sheet' of squamous epithelium, which was not a tumor, and the soft tissues were infiltrated with leukocytes" (E. Case).

During the next week the abscess continued to drain through the incision in the eyelid and the massive tumefaction receded. The headache was gone, and temperature, pulse and respiration were normal, as were the blood and urine. The report of examination on March 2 was: "Vision 5/9 in the left eye. Mobility has returned in all directions, except for slight impairment of upward movement. The vessels of the fundus are still markedly engorged."

On March 6, the patient having been transferred back to my service, the area of the left frontal sinus was investigated, with anesthesia induced with tribromethanol in amylene hydrate. Roentgenograms on March 2 apparently showed a loss of most of the floor of the left frontal sinus, as well as of the external wall and, in addition, a large erosion cavity lateral to the sinus with no internal table. These findings were confirmed at operation. A large part of the floor of the sinus was missing, and the orbital ridge was largely sequestrated and movable. The external wall of the sinus was missing in part, and the remainder was thin,

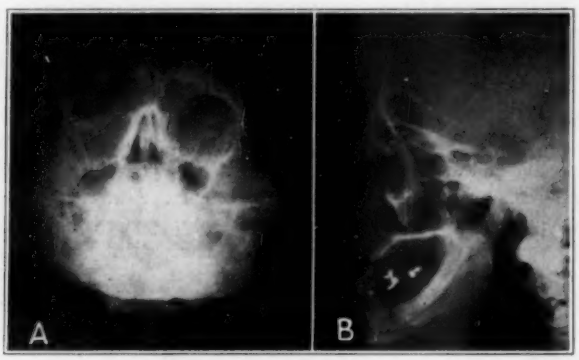

Fig. 1.—*A*, roentgenogram before operation. The right side appears on the left of the photograph. Note lateral extension due to erosion. *B*, roentgenogram before operation. Note the erosion cavity with exposed dura.

soft and infected. The cavity of the sinus was small, with the internal wall intact, but lateral to the true sinus cavity was another, continuous with it, with no dural plate but with the outer wall intact. Beneath this cavity, which extended to above the outer canthus and upward about 2 cm., the exposed dura was much thickened from chronic inflammation. The interior of these combined cavities was filled with a whitish-gray mass, which shelled out easily, almost intact. It was found to be arranged in concentric layers and was similar in appearance to the cholesteatoma so frequently found in chronic disease of the mastoid, except that there was no offensive odor. This is also lacking in some cholesteatomas of the mastoid. After thorough removal, it was thought that a thin and unhealthy matrix was present. The opening of the nasofrontal duct was firmly plugged by one or two small polypi. On removal of these, the duct appeared to be of ample caliber for drainage, and as the mucosa looked healthy, no further attention was paid to it. The wound was completely sutured, with a drain through the fistula in the upper lid, and compression was applied to effect obliteration of the sinus if possible. This was facilitated by the absence of a large part of the orbital ridge.

The culture taken at this time was reported as showing a nonhemolytic strain of Staphylococcus albus. The laboratory report on the material removed from the sinus was: "The material contained many cholesterol crystals and hematinized epithelium. The bone was dense but did not show any epithelium attached. The diagnosis is cholesteatoma."

The remaining history of the case is commonplace. The sinus cavity continued to drain decreasing amounts through the fistula in the eyelid until the twelfth postoperative day, when drains were removed. At this time the anterior third of the middle turbinate was removed to facilitate nasal drainage, which thereafter came only through the nose. The fistula was reopened two or three times in the ensuing three months to release small collections of serum after discharge through the nose had ceased. All sutures had been removed by the fourth day after operation; the patient was up and about without symptoms; the edema was rapidly disappearing, and he was able to open the eye voluntarily. There appeared to be no diplopia. During the entire postoperative course he was afebrile and was without symptoms except those local to the wound.

He was last seen early in May 1937. The frontal sinus was well obliterated, and there was no inflammation or discharge either externally or intranasally. Movements of the eyelids were normal, and the attending ophthalmologist, Dr.

Fig. 2.—*A*, the patient two days after operation. Note the proptosis of the left eye. *B* and C, the condition five days after operation. *D*, the patient three weeks after operation.

C. P. Franklin, reported that vision was normal and that the proptosis had almost disappeared. So far, there has been no recurrence of the cholesteatoma, and I think that I may feel fairly well assured that it has been eradicated.

After this case report was written, Dr. Fletcher Woodward, seeing my title in the program, forwarded to me the notes of a case of his and authorized me to add them to mine. The discovery of this case of Dr. Woodward's removed from my mind the last doubt as to the correctness of my diagnosis, for Dr. Woodward is a very intelligent and careful observer.

Dr. Woodward's notes are as follows:

History.—Mrs. I. C., aged 27, was admitted to the hospital on June 14, 1926, and was discharged on July 16, after thirty-two days in the hospital.

Chronic cough, pain in the chest, shortness of breath, nervousness and frontal headache on the right side had been noted for nine months.

Present Illness.—Severe sudden pain developed over the right eye seventeen days before the patient's admission, with gradual swelling; in two days the eye was completely shut, the pain continued and no nasal discharge was noted; the

eye remained swollen shut for seven days. For the next six days there was a discharge from the nose, pain and swelling subsided and the patient was fairly comfortable; then pain and swelling returned and increased during the two days before admission.

Examination.—There was a round fluctuant swelling 2 by 2 cm. over the right frontal area; the skin was reddened, with considerable chemosis of the right upper lid. The eye was swollen shut, with the globe in its normal position but fixed; vision was 20/100. Examination otherwise gave negative results. The maxillary and the left frontal sinus were clear on illumination.

Roentgenograms were made of the sinuses on June 15, 1926. There was apparently a clouding of both frontal sinuses. There was a large shadow of decreased density in the right frontal sinus, which encroached on the orbit, causing the periosteum to be stripped up at that point. Owing to the decreased density, a mucocele was suspected.

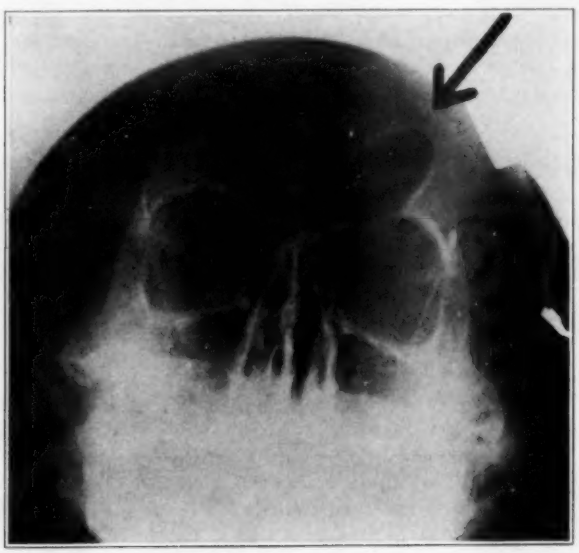

Fig. 3.—Roentgenogram of Dr. Woodward's patient before operation. Note the erosion cavity pointed out by the arrow.

Operation.—Sinusostomy of the right frontal sinus was done by the external approach on June 17. With ether anesthesia the usual incision was made through the brow and down to the inner canthus. The periosteum was reflected from the roof and the inner wall of the orbit, and the floor of the right frontal sinus was removed with a punch forceps. Free pus was encountered on entering the sinus, and considerable necrotic membrane and thick pus were removed. Lying free in the sinus was a mass of cholesteatoma about 2 by 3 cm. It was identical with similar masses encountered in the mastoid, being composed of layers of white and glistening epithelium. After the sinus was cleaned, it was noted that the posterior wall was necrosed away and a large dural exposure covered with granulations was found. There was also necrotic perforation of the anterior wall, with an overlying subperiosteal abscess.

After the sinus was carefully cleaned, a rubber tube drain was inserted through the anterior perforation by making a counter incision through the skin. The drain was then passed through the frontonasal opening into the nose. The tube was perforated at a point within the sinus, and the wound was closed in the usual manner.

Postoperative Course.—The course was uneventful. A solution of sodium hypochlorite was injected through the tube every four hours for several days; then the tube was removed and a new rubber tube drain was inserted into the sinus through the anterior perforation and left in for two weeks.

On June 23 the clips were removed; the incision was healed and the drain still in situ; 2 cc. of a solution of sodium hypochlorite was injected daily.

On July 1 the tube drain was removed and the sinus was clear.

On July 16 the patient was discharged; the wound was healed, with no deformity.

Culture showed Staph. albus. The urine was normal, and the Wassermann reaction was negative.

The patient did not have any fever, and the course was entirely uneventful. The patient has not been seen since her discharge from the hospital. A follow-up letter sent on May 5, 1937, has not been answered at the time of writing.

Pathologic Report.—Pathologic examination was done on June 17. Macroscopic inspection showed several pieces of tissue, one surface of which was white and glistening, the other surface rough and pink.

Direct microscopic examination showed blood, pus, numerous collections of horny cells and a number of cholesterol crystals.

Microscopic sections showed a homogeneous and partly fibrillar structure.

The diagnosis was cholesteatoma.

NASOPHARYNGEAL ABSCESSES AND CYSTS

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My interest in nasopharyngeal abscesses and cysts was aroused two years ago, when B. M. Kully [1] reported 88 cases. I then recalled a similar article by Yankauer,[2] published in 1929, reporting 155 cases, and since I could not recall having observed similar conditions, which are apparently so common, I began to wonder why this was so. The answer was soon obvious when I realized that I had not really looked for them, and I think the reason I had not looked for them was also obvious, for there have been only four articles and four reports of single cases in American journals, and only three of these articles and one case report were published in the past twenty years.

Dorrance [3] in 1931 gave a rather complete historical survey and listed forty-four references in his bibliography. Kully listed fifty-six references, the majority of which were to articles in foreign journals which appeared prior to 1917.

It is this dearth of articles on a common condition, which is readily diagnosed and treated and of which the symptomatology is definite, that leads me to bring it to attention, with a summary of the literature and of my 14 cases, 12 of them observed in the past two years, since my interest was aroused.

In the consideration of these conditions, one must first eliminate abscess due to trauma, suppuration of the petrous apex or the lymph glands, degeneration cysts, dermoid cysts and cysts of branchiogenic origin as well as meningoceles and encephaloceles, limiting the discussion to infected retention cysts of the adenoid tissue or of the pharyngeal bursa.

There has been much controversy as to the embryologic origin of the pharyngeal bursa, but Dorrance's review of the literature in regard

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Read at the Forty-Third Annual Meeting of the American Laryngological, Rhinological and Otological Society, Inc., Atlantic City, N. J., June 4, 1937.

1. Kully, B. M.: Cysts and Retention Abscesses of the Nasopharynx: A Report of Eighty-Eight Cases, J. Laryng. & Otol. **50**:317-328 (May) 1935.

2. Yankauer, S.: Nasopharyngeal Abscess: A Report of One Hundred and Fifty-Five Cases, Tr. Am. Acad. Ophth. **34**:364-375, 1929.

3. Dorrance, G. M.: The So-Called Bursa Pharyngea in Man: Its Origin, Relationship with the Adjoining Nasopharyngeal Structures and Pathology, Arch. Otolaryng. **13**:187-224 (Feb.) 1931.

to this was rather complete; so I shall summarize his historical survey as follows:

In 1838 Rathke described his pouch as the embryonic pharyngeal opening of the craniopharyngeal canal.

In 1842 Mayer first described in man an invagination of the pharynx that is supposed to have been the structure subsequently called the bursa pharyngea.

In 1877 Seessel described an invagination or pocket lower down in the pharyngeal wall, which was later studied by Nusbaum, who concluded that in the main it pertains only to the embryo and that it is of little or no importance.

In 1882 Froriep stated that the bursa pharyngea is found at the site of the attachment of the notochord to the primitive pharyngeal wall.

In 1885 Tornwaldt drew the attention of clinicians to the bursa in a publication in which he held that disease of the bursa is responsible for many systemic disturbances, though perhaps in some of his cases the lesions were pocketings of the pharyngeal tonsil.

In 1886 Trautmann called attention to a deepened furrow embedded between the ridges of the pharyngeal tonsil, and physicians now know that pathologic adhesions here can produce a cystlike cavity.

The discussion of these conditions went on for many years, and notable among the many discussers were Schwabach, Killian, Gradenigo and von Lushka.

Dorrance said:

The term bursa identifies a closed sac lined with endothelium. While the so-called bursa pharyngea is not a closed sac nor of mesodermic origin, long usage justifies the application of the term. The term bursa pharyngea designates a saclike depression in the posterior wall of the nasopharynx just above the uppermost fibers of the superior constrictor muscle and usually extends upward and backward toward the occipital bone which it sometimes reaches with its apex. It is a well marked structure in the human embryo, although it seems to be rare as a distinct structure in the adult.

His conclusions in part were:

1. A true bursa pharyngea in adults is an independent structure and is not to be regarded simply as the median recess of the pharyngeal tonsil.

2. It does not develop from Seessel's pocket.

3. It does not develop from Rathke's pouch.

4. A true bursa pharyngea occurs somewhat frequently in man during embryonal life; it takes its origin from adhesions of the notochord to the pharyngeal entoderm.

5. It is probable that the bursa in adults represents persistence of the embryonal bursa and may be the seat of inflammation and cyst formation.

Yankauer confirmed the frequency of these conditions in his paper in 1929 and reported 155 cases. He claimed, however, that the involvement was due to suppuration in the remnants of adenoid tissue and not in the bursa pharyngea. Two thirds of his patients were from 20 to 40

years of age, and 93 per cent of them had not had their adenoids removed. The associated symptoms were postcervical adenitis and postnasal discharge in 66.5 per cent, occipital headache or pain in the back of the neck in 68 per cent, otalgia in 15 per cent and focal disease in 5 per cent. He opened the lesions under direct vision and removed the excess lymphoid tissues with punch forceps and then painted the area with a 20 per cent solution of silver nitrate. His results were uniformly good, and otolaryngologists are indebted to him for again bringing these conditions to their attention after a lapse of many years. However, I feel that he was in error in attributing practically all of them to abscesses of the recessus medius of the pharyngeal tonsil.

In 1928 Hagens [4] reported the occurrence of a typical bursa pharyngea in a man 70 years of age, studied post mortem. The cavity was 11 by 7 mm. and contained a cheesy mass of acellular material. An ostium was noted at the dependent portion, and microscopic sections showed it to be lined with cuboidal epithelium. The wall of the sac was composed of dense connective tissue, sinusoidal vessels and well developed vessels. Small lymphocytes and plasma cells were noted throughout and also several glands and lymph follicles.

Kully in 1935 reported 88 cases of cyst and retention abscess of the nasopharynx, observed in a six year period, and stated that the scarcity of reports is due to failure in comprehension and diagnosis rather than to the rarity of the condition. He further stated that there has been much confusion in the literature in the use of the terms cyst and retention abscess. Strictly speaking, the so-called retention abscess of the nasopharynx is not an abscess. It represents an inflammatory closure of the mouth of an adenoid recess or of the pharyngeal bursa, with retention of secretion, bacteria, cells and other inflammatory detritus. As the cavity dilates, owing to the accumulation of secretion, it partakes of the nature of a cyst, but on microscopic section there may be few polymorphonuclear cells and a definite cyst wall. This condition should be described as an infected retention cyst. In sixty-two of his cases the lesion was of this type. He further stated:

> From a clinical view point, I have classified as retention cysts of the adenoid those which were definitely surrounded by adenoid tissue and whose cavities could be entered by separating the folds with a probe. Cysts with a smooth surface without evidence of adenoid folds are regarded as originating in the bursa. This classification is arbitrary and subject to error.

The cardinal symptoms presented by his 88 patients were postnasal discharge, chronic pharyngitis and laryngotracheitis in 54.5 per cent, enlargement and tenderness of the posterior cervical glands in 30 per cent, frequently associated with stiffness and rigidity of the muscles of the posterior cervical region, occipital headache in 14 per cent, otalgia

4. Hagens, E. W.: Cystlike Cavity in the Nasopharynx, Arch. Otolaryng. **8**:420-423 (Oct.) 1928.

in 0.6 per cent and tinnitus and moderate deafness in 0.8 per cent; a few had persistent fever or focal disease, and 25 per cent had no symptoms, the condition being discovered in a routine examination.

A summary of my 14 cases reveals the following: All the lesions occurred in young adults. Four of them were retention abscesses of the median cleft of the pharyngeal tonsil. Ten were retention abscesses of the pharyngeal bursa and presented on inspection a smooth bulging surface, yellowish or white, situated high up in the nasopharynx and usually a little lateral to the midline. They were from 1 to 2 cm. in diameter, and their retained secretions were under sufficient pressure to produce a taut anterior surface. Postnasal discharge, sore throat and cough were the symptoms in 4 cases, deafness and tinnitus in 5, postcervical pain and adenitis in 1, otalgia in 3, a sense of soreness in the nasopharynx in 3 and focal disease, with no localizing symptoms in 1. The last-mentioned case was perhaps the most interesting of all in that the patient was a student who had been forced to leave school because of persistent chorioretinitis. Most careful search for foci of infection had given entirely negative results in two medical centers. My examination likewise gave negative results, except for a definitely infected bursa pharyngea, which was opened with a punch forceps. Cultures showed hemolytic and nonhemolytic staphylococci, hemolytic and nonhemolytic streptococci, Streptococcus viridans and Micrococcus catarrhalis. An autogenous vaccine was made and used. After operation and treatment with the vaccine the condition of the eye rapidly cleared, and the patient has been able to resume his work.

The diagnosis is readily made by examination with mirrors, provided sufficient time and mirrors of various sizes and angles are used. The nasopharyngoscope is of no value, since its blindspot covers the area where these conditions arise. When such a condition has been noted by posterior rhinoscopy, it can be further studied by anterior rhinoscopy, and by the use of a probe, under direct vision, much additional information can be obtained.

The treatment has been the surgical removal of the anterior wall with a punch forceps, working either through the mouth under direct vision or through the nose. If the abscess is definitely located, the forceps can be placed through one side of the nose and inspection carried out through the other side and with a postnasal mirror. Direct inspection is aided by the Yankauer nasopharyngeal speculum.

There have been no recurrences in this series in the period in which the patients have been followed.

The origin, pathology, frequency and symptomatology have been well covered in the articles referred to in the footnotes. I have quoted them to a large extent and have merely attempted to summarize them, report a small group of cases and direct attention again to a much neglected condition.

SUPPURATION OF THE PETROUS PYRAMID

SOME VIEWS ON ITS SURGICAL MANAGEMENT

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Suppuration of the petrous pyramid is a serious complication of otitis media. By suppuration of the petrous pyramid is meant an infection of some part of the cellular structure surrounding the cochlea and the semicircular canals which usually localizes in the apical area as empyema. Thus the term apicitis or suppuration of the petrous apex is used. According to my figures, this condition occurs approximately once in every 300 cases of otitis media.

A majority of patients with this complication recover without resort to surgical intervention. In a small percentage of cases the disease does not localize but spreads by way of the vascular channels, causing fatal meningitis. This is usually a nonsuppurative lesion. No means of combating this type of the disease is available. The remainder of the cases constitute the 30 or 40 per cent in which the condition becomes a surgical problem.

The petrous portion of the temporal bone is a pyramidal structure having a basal and an apical portion and three surfaces. The base consists of the medial aspect of the middle ear and the mastoid cavity. It contains the cochlea anteriorly and the semicircular canals posteriorly. Adjacent to these structures are to be found tracts of cells which usually extend along their perilabyrinthine course into the apex or may terminate before they reach this region.

The apical area is rather truncated and does not constitute a true apex. It extends from the internal auditory meatus to the lateral aspect of the body of the sphenoid bone. Medially the apex is in relation to the lacerated foramen, which transmits the internal carotid artery, and antero-inferiorly, to the horizontal portion of the same artery in its bony canal.

The anterior surface of the petrous pyramid extends from the eminentia arcuata, the eminence above the arch of the superior semicircular canal, to the lateral aspect of the body of the sphenoid. This surface is in contact with the dura of the middle fossa (temporal lobe), which is especially adherent in the region of the apex, where the fibers of the gasserian ganglion are attached.

Read before the Otolaryngological Society of the District of Columbia, April 16, 1937.

The posterior surface is in contact with the cerebellar dura and extends from the lateral prominence of the posterior semicircular canal to the apex. This surface presents the ductus endolymphaticus just beyond the posterior canal. More medially is situated the internal auditory meatus, which transmits the seventh and eighth cranial nerves.

The inferior surface begins with the vertical portion of the carotid canal and extends to the foramen lacerum. This surface consists principally of a quadrilateral plate of bone on which rests the horizontal portion of the internal carotid artery. To this plate of bone are attached the tendon of the levator veli palatini muscle and the pharyngeal aponeurosis. This plate of bone is part of the roof of the retropharyngeal space.

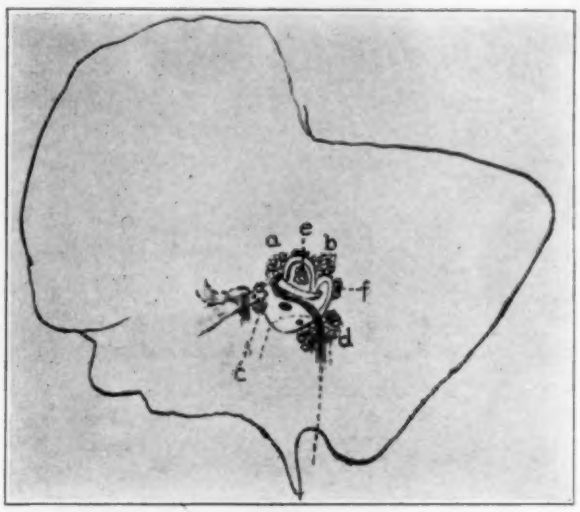

Fig. 1.—A semidiagrammatic reproduction of the structures of the middle ear and the mastoid in relation to the base of the petrous pyramid. Areas marked *a, e, b, f, d* and *c* indicate where the beginning of tracts of softened bone leading into the apex may be found. This figure is reproduced from a previous issue of the ARCHIVES (**22**:70 [July] 1935).

Owing to its complex structure, the bone may become involved in different locations and cause symptoms according to the structures implicated. Two principal locations of the disease are distinguished—superior and inferior. The superiorly placed infection is evidenced in the roentgen study by a break in the superior line, or roof, of the apical cavity. This indicates an extrapetrosal lesion, which is really a large epidural abscess. This lesion is harmless from the standpoint of the production of future meningitis or abscess of the brain for varying lengths of time. There are many who believe that one can wait until there is definite evidence of meningeal irritation before sur-

gical treatment of the petrous apex is done. I believe this to be perfectly safe in a majority of instances. I should prefer, however, to rely on the roentgen findings and the clinical symptoms, with the expectation that surgical operation would be performed long before meningeal irritation occurred.

In the inferiorly placed infections the disease has not reached the roof of the apical cavity but the pus has accumulated in its inferior portion. This is because the osteomyelitic process which preceded the

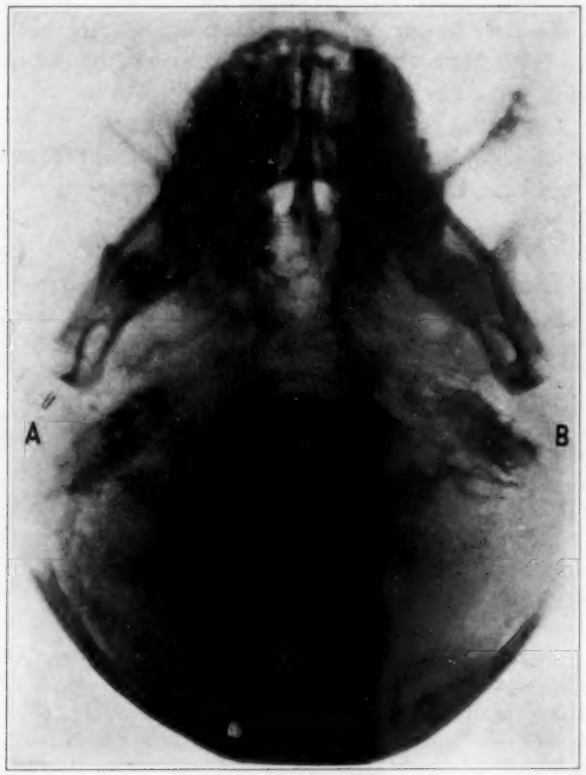

Fig. 2.—Film taken in the base, or mentovertical, position: Note the loss of detail of structure in the right apex (*A*) as compared with the normal side (*B*).

empyema was confined to the infralabyrinthine, or hypotympanic, portion of the bone. When such is the case, the roentgenograms taken in the Stenver position or in the supero-inferior axis show no break in the continuity of the line of the roof of the apex, but the film taken in the base position gives evidence of loss of detail of the structures in the apical area. This combination of roentgen findings indicates that the disease is in the basal portion of the petrous apex. When the disease is so located, the film taken in the Stenver position may show

partial or complete absence of detail of structure in the apical area, but the line of the roof will be intact.

The symptomatology of this disease is well known and understood. It is based on the location and the activity of the infectious process. The patient may complain of ocular pain or pain in the forehead with both superior and inferior infection. He is much more likely to complain of headache with the superiorly placed infection. In the inferiorly placed disease the quadrilateral plate of bone on which the carotid artery rests becomes involved. When pus is trapped under pressure in the carotid canal or when there is acute congestive inflammation of this structure, the carotid sympathetic nerves may become affected, causing Horner's syndrome. Recently I observed a patient who pre-

Fig. 3.—Film taken in the Stenver position: Note the right side (*A*), in which the line of the roof of the apex is gone, as compared with the other side (*B*), which is normal. This figure is reproduced from an earlier issue of the ARCHIVES (**22**:80 [July] 1935).

sented this syndrome. In addition to causing Horner's syndrome, disease of the carotid canal will cause pain on motion of the temporomandibular joint, which is localized to the innermost parts of the glenoid cavity.

The discharge may be profuse, moderate, scanty or absent. In many cases no discharge from the middle ear is present but there is a moderate or profuse discharge from the mastoidectomy wound. A relatively increased pulse rate is a symptom of importance. In the type of suppuration of the petrous pyramid requiring surgical treatment the pulse rate is elevated out of proportion to the temperature.

Because of the variety and number of operations which have been advocated for the cure of empyema of the petrous apex, a great deal

of confusion exists in regard to the management of this condition. One should aim to simplify the treatment as much as possible and to maintain a conservative attitude.[1] Conservatism is important in all surgical procedures, but especially so in those involving the temporal bone, in which the hearing is sacrificed by radical procedures. Therefore, whenever possible radical mastoidectomy should be avoided. Resection of large areas of normal tissue is unnecessary in most cases. Procedures, such as those of Ramadier and Lempert, which entail radical mastoidectomy and interference with the function of the temporomandibular joint should be considered only as a last resort.

When one is treating this condition, it is important that one know whether the infection is in the upper or the lower part of the apex. This information can best be obtained by means of roentgen study together with an interpretation of symptoms which suggest one location or the other. In the superiorly placed infection simple mastoidectomy is first performed or the previous mastoidectomy wound is revised. The superior semicircular canal must then be skeletonized, with exposure for purposes of probing the region within the arch and anterior and posterior to the canal. The probing is done to detect a tract of softened bone leading into the apex. Probing such a softened tract will liberate the pus which is locked in the apical area in many cases.

If a tract of softened bone is not found, the apex should be approached by way of the anterior surface.[2] This entails elevation of the temporal lobe after its adequate exposure. Before this approach is undertaken, a copious removal of the spinal fluid is carried out by either lumbar or cisternal puncture. This lessens the intracranial pressure and enables one to elevate the temporal lobe more readily. A section of the squamous portion about the size of a silver dollar is removed. This extends from the sinodural angle posteriorly to a point ½ inch (1.25 cm.) anterior to the zygomatic root. In addition, the tegmen of the mastoid is resected. The temporal lobe is now elevated, with the posterosuperior border of the petrous pyramid always in view. Four landmarks are utilized in this procedure—first, an elevation, the eminentia arcuata, directly above the superior semicircular canal; then a depression, the fossa subarcuata; then an elevation, the roof of the internal auditory meatus, and last, a depression which constitutes the roof of the apical cavity on which rests the gasserian ganglion. When the roof of the apical area is encountered, a defect is found which was being corked by the dura. As soon as this defect is met, there occurs a gush of pus from the apical cavity.

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1. Myerson, M. C.; Rubin, H. W., and Gilbert, J. G.: Considerations on Suppuration of the Petrous Pyramid, Arch. Otolaryng. **22**:62 (July) 1935.

2. Myerson, M. C.; Rubin, H. W., and Gilbert, J. G.: Improved Operative Technic for Suppuration of the Petrous Apex, Arch. Otolaryng. **19**:699 (June) 1934.

If the operator should decide that uncapping of the carotid canal and visualization of the floor and the posterior wall of the apical cavity are necessary, the approach just outlined will be found ample. The exposure afforded by this operation is both satisfactory and harmless. It can be performed without injury to the dura, the middle meningeal artery or any other structure. Complete apicectomy, as described by Lempert,[3] can be performed by means of this approach without recourse to destruction of the mechanism of the middle ear and without mutilation of the temporomandibular joint.

I do not agree that elevation of the temporal lobe entails the risk of tearing the dura. Nor am I in favor of extensive operations which expose the carotid artery and destroy the integrity of the temporomandibular joint as a routine. That portion of the carotid artery which lies in the petrous bone and is thin has a wall the structure of which is like that of a vein. My attention was called to this several years ago by Richards.[4] It is possible that undue exposure of this portion of the artery may predispose it to the formation of aneurysm because of the lack of the support which nature has provided.

If the roentgen study and clinical signs and symptoms indicate an inferiorly placed infection, I concentrate my attention on the sublabyrinthine area of the mastoid during the performance of a simple mastoidectomy. The area just below the posterior semicircular canal is carefully searched for the beginning of a tract of softened bone which leads into the apex. Another point from which a similar tract may be found is located just below the eustachian tube, between the cochlea and the carotid artery. A radical mastoidectomy is required to expose this region. I do not favor this procedure and see no necessity for it in the treatment of empyema of the petrous apex. A radical mastoidectomy sacrifices the hearing. This fact should be given serious consideration if the patient is a child.

If no tract of softened bone is found, it is perfectly safe to wait for possible erosion of the pus through the inferior surface of the petrosa and the formation of a nasopharyngeal abscess. If this does not occur and meningeal irritation makes its appearance, operation should be performed by means of a cervical incision for draining the apex inferiorly.[5] This operation is performed through an incision

3. Lempert, Julius: Complete Apicectomy (Mastoidotympanoapicectomy), Arch. Otolaryng. **25**:144 (Feb.) 1937.

4. Richards, John D.: The Petrous Pyramid: Its Surgical Anatomy and the Technic of the Operation for Its Removal, Am. J. Surg. **2**:11 (Jan.) 1927.

5. Myerson, M. C.; Blumberg, Ralph, and Rubin, H. W.: A Proposed Operation for Osteomyelitis of the Inferior Aspect of the Petrous Pyramid, Arch. Otolaryng. **25**:373 (April) 1937.

along the anterior margin of the sternocleidomastoid muscle; the retropharyngeal space is exposed up to its roof, which is the inferior aspect of the area of the petrous apex. When this region is reached, the attachment of the levator veli palatini muscle and that of the pharyngeal aponeurosis to the quadrilateral plate of bone are identified. These attachments are scraped aside with an elevator, and the diseased quadrilateral plate of bone, which constitutes the floor of the carotid canal, is firmly probed. The bone is either softened or liquefied, so that it yields to the pressure of the instrument. Withdrawal of the instrument is followed by a gush of pus when pus is present.

When the infection is inferiorly placed and there is evidence on the roentgenogram of extensive destruction of the bony substance within the apical cavity, the operator should attempt to enter this cavity through any lead which the roentgenogram offers. This lead may be either anterior or posterior to the superior semicircular canal, or it may be below the posterior canal. All these locations can be exposed and attacked without recourse to radical mastoidectomy.

In conclusion, a simplified and conservative plan of management is offered for suppuration of the petrous pyramid which ends in apical empyema and requires surgical intervention. There is no justification for extensive, difficult and in some instances destructive operations in a great majority of cases. There is no need for a radical mastoidectomy in the treatment of empyema of the petrous apex, nor is there justification for operations, such as those of Ramadier [6] and Lempert,[3] which require extensive removal of healthy bone and which compromise the temporomandibular joint.

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6. Ramadier, J.: Les ostéites pétreuses profondes (pétrosites), Oto-rhino-laryng. internat. **17**:816 (Nov.) 1933.

A METHOD OF DRAINING CEREBRAL ABSCESSES

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The purpose of this paper is to call attention to some of the more important physiologic and pathologic factors and principles underlying infection of brain tissue and to detail a method of treatment which in my hands has proved satisfactory. In an effort to do this I shall not go into the problems of etiology and symptomatology but shall confine my remarks to a brief summary of the operative and postoperative course in four cases chosen to illustrate three types of disease of the brain—traumatic disease, acute abscess and chronic abscess. I shall quote from textbooks excerpts which I think have a bearing on the method of drainage of abscess of the brain with which this treatise is concerned.

CASE 1.—W. F. S., a man about 35 years of age, was injured on May 4, 1925, by a piece of 1 by 1 inch (2.5 by 2.5 cm.) lumber driven with considerable force between the eyes. Some eight hours later he was brought into the hospital, where examination showed marked edema of the eyelids and the surrounding soft tissues. There was compound fracture of both frontal sinuses and both ethmoid sinuses in the midline. Part of the bone forming these structures had been driven into the brain, causing a rent in the dura, 1½ inches (3.7 cm.) in length, from the cribriform plate toward the vertex, paralleling the longitudinal sinus and adjacent to this structure. Protruding through this laceration in the dura was about a tablespoonful (15 cc.) of cerebral tissue, in which were embedded dirt and fragments of bone.

At operation a complete removal of the outer wall of both frontal sinuses as well as of the anterior ethmoid cells was effected. The protruding brain tissue was excised at the level of the dura. By gentle probing several sizable fragments of bone were removed from a depth of 1 inch in the frontal lobe of the brain. After the pieces of bone which were found were fitted together, it was thought likely that some fragments remained in the brain tissue. The lacerated area of the frontal lobe was drained with a short strip of rubber tissue. Iodoform gauze was packed around the area of the dural decompression, and a wet dressing was applied. It was impossible even partially to close the rent in the dura owing to the proximity of the longitudinal sinus. The patient was in a semiconscious condition when he was operated on, but on the following day he was rational, his only complaint being headache. Three days later pus began to make its appearance through the opening in the dura. His headache increased in severity, and in another forty-eight hours he had symptoms of encephalitis. At that time the drain through the dura was changed to a perforated rubber tube. This did not relieve his symptoms; so, thinking that probably there were pieces of bone in the brain, which were causing this suppuration, I packed the lacerated area of the brain with a long strip of rubber tissue, using sufficient tissue to expand the

Read before the Texas Ophthalmological and Otolaryngological Society, Fort Worth, Texas, Dec. 11, 1936.

area, hoping in this manner to coax the bone to the surface. The following day the condition was markedly improved. In the next two weeks several small particles of bone came away, and the discharge almost ceased. Removal of the rubber tissue pack was begun at that time and was completed within the next two weeks.

This man was bothered with diplopia for about six months and then made a complete recovery, except that he suffered from headache when he became overheated or indulged in hard work.

CASE 2.—F., a boy aged 12 years, came to the hospital complaining of headache. His left ear had been draining since he had scarlet fever in childhood. Examination showed destruction of the drum membrane and ossicular necrosis associated with cholesteatoma. A radical mastoidectomy was advised and performed.

At operation cholesteatomatous material was found filling the mastoid antrum. The dura over the antrum and the aditus had been exposed by the cholesteatoma and was covered with what appeared to be healthy granulation tissue. This pathologic decompression was enlarged to the normal dura. Convalescence was not remarkable, except that he still complained of some headache. He returned to his home, and ten days later I was called to see him. I found him in a semiconscious condition. He had many of the cardinal symptoms of an abscess of the temporal lobe.

At operation the decompression was enlarged and a small incision was made in the dura through an area of granulation tissue, which looked darker than its surroundings. A closed bayonet forceps was then introduced into the temporal lobe about ¼ inch (0.6 cm.), where it liberated a large amount of fetid pus containing a considerable quantity of gas. A perforated rubber tube was placed well into the region of the abscess.

This patient was rational a few hours later and continued so for four days. He then acquired symptoms of encephalitis. Examination showed the drainage tube apparently in good position, and there had been no change in the amount of drainage. At that time a speculum was introduced into the abscess area and a long strip of rubber tissue was packed into the abscess, enough being used to distend its walls.

By the following day this patient had lost his lethargy, and he was free from symptoms for four days. In this time the brain extruded most of the packing. Concurrently, there was a return of headache and drowsiness, which abated as soon as the abscess was packed again. The packing was completely removed six weeks after operation, and he made a complete recovery.

CASE 3.—Mrs. P., aged 26, came to the hospital complaining of severe headache over the left side for the previous six weeks. Her left ear had been discharging for four months. A simple operation on the mastoid was advised and proceeded with immediately.

A large epidural abscess was present, covering the dura over the tegmen of the antrum and extending posterolaterally over the knee of the lateral sinus. The inner table of bone was removed until healthy dura was exposed. The dura was covered with apparently healthy granulation tissue.

On the day following operation this patient was free from symptoms and continued so for seven days. She then acquired marked headache and became semiconscious. Examination showed many of the cardinal symptoms of an abscess of the temporal lobe of the cerebrum.

At operation the decompression was enlarged, a small incision was made parallel to the vessels in the dura and a bayonet forceps was passed into the posterior part of the temporal lobe, where an abscess was entered and thick

greenish-yellow pus having no odor was evacuated. As the pus began to escape, I packed this abscess with a long strip of rubber tissue, using enough to keep the walls of the abscess distended.

The patient made an uninterrupted recovery, except that about the sixth postoperative day she began to have headache and aphasia began to return. It was found that the brain had expelled considerable of the rubber tissue. This was replaced, and she made a complete recovery.

CASE 4.—N. D., a boy aged 12 years, was admitted to the hospital on Aug. 31, 1932, complaining of pain in the region of the left mastoid, headache and frequent chills followed by fever. Examination revealed that he was very sick. A diagnosis was made of acute mastoiditis on the left side superimposed on chronic purulent mastoiditis complicated by thrombosis of the sigmoid portion of the left lateral sinus and septicemia. At operation a cholesteatomatous mass was found, a radical mastoidectomy was performed and the lateral sinus was found to contain purulent fluid. The dura over the temporal lobe of the cerebrum in the region of the mastoid and the dura over the anterior surface of the cerebellum were very necrotic. The operative procedure was completed by resection of the left internal jugular vein and the placing of packs in the proximal and distal openings of the lateral sinus. Owing to the shocked condition of the patient, the lateral sinus could not be decompressed toward the torcular. After this operation he presented typical fulminating septicemia for seven days; the lateral sinus was then decompressed toward the torcular until free bleeding occurred from its lumen. After this procedure the symptoms of fulminating septicemia abated, but pulmonary infarction with a septic embolus occurred, which was followed by a pulmonary abscess. Postural drainage, numerous bronchoscopic drainages, repeated blood transfusions and other treatment corrected this condition. Owing to the large area of necrotic dura present, herniation of the cerebrum and cerebellum into the mastoid cavity occurred. Consequently, thirty-seven days after the operation on the mastoid a plastic operation was performed on the scalp of the region to cover and protect this brain tissue.

The patient apparently recovered completely from this illness. He returned to school and acquitted himself well in studies and athletic activities, being free from headache or other symptoms referable to his ear until four years and four months after the mastoidectomy, when he returned complaining of headache, diplopia and pain in his left ear. Questioning revealed that two weeks previous to his return he had a fainting spell and felt that something was wrong inside his head. He then began to feel tenderness over the left mastoid area, which was slightly hyperemic over the scar. Diplopia was present and both fundi oculorum showed papilledema. Owing to the herniation of the brain into the mastoid cavity, there was complete atresia of the external auditory canal. Pus was evidently present in the mastoid area. Accordingly, an incision was made through the scar from the mastoidectomy. Pus which had a slight odor was evacuated from the region of the tympanum. An opening was found through the dura over the temporal lobe of the cerebrum, through which pus was draining. Without any more evacuation of this pus than was necessary, two strips of rubber tissue about ¼ inch (0.6 cm.) in width and about 2 feet (60 cm.) in length were packed into the cerebrum through this opening, as the pus which the rubber displaced escaped.

After this operation the headache, diplopia and papilledema persisted for three weeks. The rubber tissue was removed beginning about four weeks after operation, removal being complete six weeks after operation. Thereafter the patient

made a complete recovery. At the time of writing he has been in school for two months and states that he is free from symptoms.

The question naturally arises: Was this abscess present during the four years of freedom from symptoms, or did it develop as an acute abscess just previous to his recent illness? This question is debatable, and I leave it to the reader's own conjecture.

Any consideration of a method of treatment of infected brain tissue would not be complete without an explanation of how and why the procedure instituted relieved the pathologic condition and corrected the pathologic physiologic relations.

For this purpose one can consider the brain a homogeneous mass suspended in a cavity filled with fluid. This fluid is under a certain amount of pressure, which is opposed by the pressure in the arteriovenous system. It also permeates along the blood vessels to the terminal capillary bed and even goes so far as to surround each nerve cell. Wright [1] stated:

> As the arteries and veins enter and leave the brain substance they are surrounded by the perivascular spaces (of Virchow and Robin) which are continuous with the subarachnoid space and also with fine spaces which surround the nerve cells.

Speaking of the cerebrospinal fluid, which he considered as a modified form of lymph, Cunningham [2] stated:

> The fluid which pervades the cerebral substance must have some exit, and it is not unlikely that it passes with the lymphocytes through cleftlike intercommunicating spaces in the adventitial coats of the blood vessels similar to those demonstrated by Bruce in the case of the spinal medulla and so reaches the pia mater and subarachnoid space; that is, it runs along the walls of the arteries, enters the meningeal lymphatics, and passes through them to the exterior of the cranium.

These excerpts are quoted to bring attention to the close relation of the cellular components of the cerebral substance to the cerebrospinal fluid. The fact that the entire capillary bed which permeates the cerebral tissue is itself surrounded by channels containing cerebrospinal fluid accounts for the marked effect which alteration in pressure on the capillary and cerebrospinal fluid system has on the nerve cells of the cerebrum.

In cerebral abscess, unless the condition has progressed to the point of extensive necrosis or gangrene, there is rarely destruction of a great amount of brain tissue. Rather, there is an accumulation of pus forming the abscess, surrounded by an area of compressed brain tissue, the tissue nearest the abscess being compressed most owing to the cerebritis sur-

1. Wright, S.: Applied Physiology, ed. 5, New York, Oxford University Press, 1934, p. 335.

2. Cunningham, D. J.: Text-Book of Anatomy, ed. 6, edited by A. Robinson, Baltimore, William Wood & Company, 1931, p. 1003.

rounding the inflammatory area. This accounts for the aphasia associated with abscess some distance from the anatomic speech center. In this connection, however, one must bear in mind the tendency for the more highly developed functions, such as speech, to be affected under increased pressure before the more primitive functions, such as voluntary motion.

After consideration of this balance of pressure between the cerebrospinal fluid and the extensive cerebral capillary bed, it is not difficult to appreciate the rapid and extensive transudation of fluid into the intercellular spaces which occurs when the intracranial pressure is quickly and markedly reduced, as in free incision of the dura or in turning down of a large dural flap. This sudden release of pressure in the

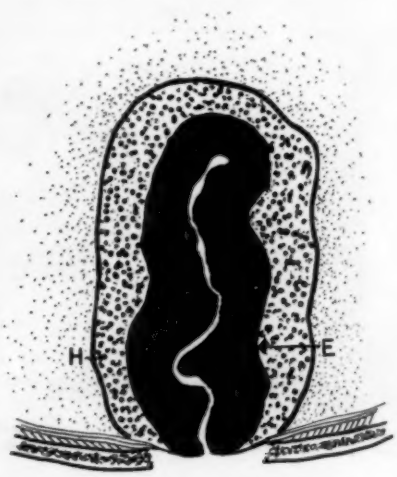

Fig. 1.—Diagrammatic illustration of a collapsed abscess showing how edematous brain tissue (*E*) fills the abscess cavity if the pus is not replaced with packing. This edema, if it is allowed to occur by sudden complete evacuation, leads to pocketing of infection and interference with the blood supply of the adjacent brain tissue and makes more difficult the proper placing of a drain. *H* indicates the area of hemorrhage and necrosis.

presence of marked cerebritis, such as accompanies abscess, results in an edematous multiplication of the volume of the brain tissue. The prevention of the formation of this edema in the wall of the abscess and also in the brain tissue adjacent to the abscess is one of the chief factors to be taken into consideration in the satisfactory treatment of cerebral abscess.

If in operation on a cerebral abscess, particularly in the acute stage, a large incision is made in the dura and the abscess is freely evacuated, the edematous brain tissue immediately fills the abscess cavity (fig. 1). This leaves no cavity or area in which to place a drain except the

edematous brain tissue. This closing in of the walls of the abscess leads to pocketing of infection, and since in the area of cerebritis surrounding the abscess the perivascular spaces are filled with lymphocytes and the excess fluid cannot be carried away, the nutrition of the brain substance is impaired and later necrosis ensues. This change in the area surrounding the abscess probably accounts for the symptoms, often fatal, which occur some days after the operative procedure.

The procedure which I have tried and found satisfactory is as follows.

The skull is removed from the dura over the area of the abscess, enough being taken away to allow the dura to bulge into the opening. The pressure of

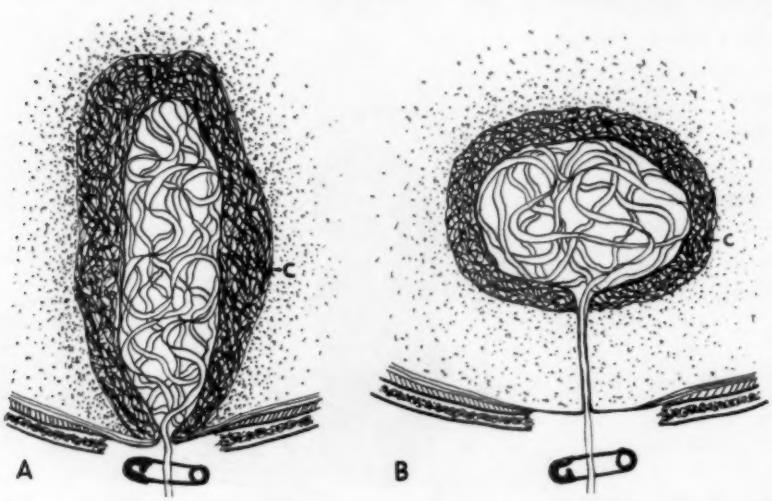

Fig. 2.—*A*, diagrammatic illustration of a cortical abscess packed with rubber tissue. The rubber tissue is packed into the abscess cavity while the pus is still in place, the amount of tissue used being determined by the amount of pus which escapes. *C* indicates the area of compressed brain tissue (cerebritis). *B*, diagrammatic illustration of a deep abscess packed with rubber tissue. This method is applicable to both cortical and deep abscess. *C* indicates the area of compressed brain tissue.

the brain against the dura around the margins of the bony defect precludes the possibility of pus entering the subdural space as it is drained from the abscess. In the center of the decompressed area a small incision is made through the dura parallel to any vessels present. A bayonet forceps is then passed into the abscess cavity. As soon as a little pus has escaped, a long strip of rubber tissue about ¼ inch (0.6 cm.) wide is packed along the bayonet forceps into the abscess cavity. As more pus escapes, more tissue is introduced, the amount used being determined by the amount of pus evacuated, the object being to fill the abscess cavity as nearly as possible with rubber tissue before the walls of the cavity collapse. The terminal end of the rubber tissue is then made secure (fig. 2).

The advantages of this procedure are these: 1. A sudden release of pressure on the walls of the abscess and the tissue surrounding the abscess is avoided. This prevents edema, alteration of blood supply and nutritive changes in the wall of the abscess and the adjacent tissue. 2. Pocketing of the abscess cavity is minimized, because the abscess cavity is retained as a cavity filled with rubber tissue instead of an area of edematous brain tissue. 3. With this cavity still present but draining and the intracerebral pressure only slightly changed, the pressure forces the inflammatory products from the tissues surrounding the abscess into the area packed with rubber tissue, from which it may find an exit.

In acute abscess formation in which some broken-down blood clots and necrotic parts of the wall of the abscess must be drained away, it may be found necessary to insert a short piece of rubber tubing along the rubber tissue to allow the more solid particles to come out. This, however, usually is not necessary until several days after the abscess is opened.

This rubber tissue is nonirritating. The pressure in the cranium may tend to force it out, but this usually does not occur until several days after it is put in place, when a fairly well defined drainage tract has been established. I have used an ordinary brain speculum shaped like a nasal speculum with long blades to repack the area. The rubber tissue has been left in place for a period depending on the symptoms of the patient and the size of the abscess. It has been removed gradually, from four to six weeks being sufficient for its complete removal.

MENINGITIS DUE TO A HEMOLYTIC STREPTOCOCCUS

REPORT OF TWO CASES WITH RECOVERY AFTER THE USE OF PRONTOSIL AND SULFANILAMIDE

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Several recent reports[1] of cases of meningitis due to a hemolytic streptococcus have included a brief but satisfactory review of the literature, with the number of reported recoveries. In a fairly large number of cases we have observed until recently but one recovery.

This occurred several years ago and followed the use of antistreptococcus serum. We did not think the case of sufficient general interest to be reported. However, the recovery of two consecutive patients recently observed is so unusual in our experience that we are briefly reporting their cases.

REPORT OF CASES

CASE 1.—A youth aged 13 was admitted to the Meadowbrook Hospital on April 3, 1937, with a history of pain in the right ear beginning seven days previously. A myringotomy had been done on March 30. On his admission there was a profuse serous discharge from the aural canal, but no other sign of mastoiditis. The right lateral rectus muscle was paralyzed. The neck was moderately rigid; the Kernig and Babinski signs were positive, and the superficial reflexes were inactive. The spinal fluid was cloudy, with 1,850 cells. The blood count showed 26,800 white cells, with 88 per cent neutrophils. The blood culture was negative.

On April 5 a simple mastoidectomy was done. The mastoid cells were filled with serous exudate throughout the process. There was no destruction of bone. In the angle between the middle fossa and the knee of the lateral sinus pus was encountered and a perisinuous abscess was uncovered. The sinus wall was necrotic.

The temperature became normal in two days. A transfusion of 500 cc. of citrated blood was given on April 13. The wound healed by primary union. The

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Read at a meeting of the Medical Society of the County of Nassau, N. Y., April 27, 1937.

1. Anderson, E. D.: Hemolytic Streptococcus Meningitis, J. A. M. A. **108**: 1591-1592 (May 8) 1937. Schillinger, R.: Otitic Meningitis, Arch. Otolaryng. **25**:455-464 (April) 1937. Coonley, F.: Streptococcus Meningitis, New York State J. Med. **37**:573-576 (March 15) 1937. Schechter, S. P.: Otitic Streptococcic Meningitis with Recovery, Arch. Otolaryng. **25**:266-271 (March) 1937. Dintenfass, H.: Streptococcic Otitic Meningitis with Recovery, ibid. **25**:311-313 (March) 1937.

patient was discharged with a healed wound and a dry middle ear on April 23, 1937. There was still moderate diplopia, which was worse when the eyes were rotated to the right.

Prontosil [2] was given as follows:

April 5	20 cc. intraspinally
April 6	20 cc. intraspinally and intramuscularly
April 6, midnight	20 cc. intraspinally and intramuscularly

Sulfanilamide was given in doses of 15 grains (0.97 Gm.) every four hours from the day following admission to April 9, when the dose was cut to 10 grains (0.69 Gm.) every four hours on account of cyanosis. On April 14 it was omitted for twenty-four hours, and administration was resumed on April 15 with 5 grains (0.32 Gm.) every four hours. It was discontinued on April 19.

TABLE 1.—*Findings in the Spinal Fluid*

Date	Cells	Polymorphonuclears, Percentage	Culture
4/ 4	1,850	53	Hemolytic streptococcus
4/ 5	1,800	61	Hemolytic streptococcus
4/ 6	2,050	66	Negative
4/ 6	5,200	75	Negative
4/ 7	1,782	75	Negative
4/ 8	280	32	Negative
4/10	100	12	Negative

CASE 2.—A boy aged 4 years, weighing 30 pounds (13.5 Kg.), was admitted to the Nassau Hospital, Mineola, N. Y., on April 9, 1937, and was discharged on May 5. He had undergone myringotomy on both sides on March 17. After this he had an irregular fever together with a fairly profuse aural discharge on both sides. The temperature ranged from 102 to 103 F., with an occasional rise to 104 for several days prior to admission. At a consultation with Drs. L. A. Van Kleeck and William McKay on the afternoon of admission the findings were negative, except for mastoiditis on both sides. Roentgenographic examination at this time showed mastoiditis with beginning breaking down in the cellular structure of both mastoids.

On April 9 mastoidectomy was done on both sides. There was beginning breaking down of the mastoid cells, with free pus on both sides. There was no exposure of the sinus or the dura.

The child continued to have a septic temperature. He received a transfusion of 180 cc. of blood on April 11. The temperature continued septic, with a rise to 105 F. on April 17. On April 19 his general well-being, with his septic temperature, made us think that we were dealing with thrombosis of a lateral sinus. Several blood cultures, prior to this, gave negative results, as did roentgenographic examination of his chest and nasal sinuses. He showed no symptoms of meningitis. A spinal puncture to determine the spinal fluid pressure on compression of the jugular vein was done. Much to our surprise, cloudy spinal fluid was obtained, with a count of 4,300 cells.

Immediate revision of both mastoidectomy incisions, with exposure of the dura of the anterior and middle fossae, was done. Search was made for sinuses leading to the petrous apex. The findings were negative on both sides.

2. The name prontosil has been applied to several different preparations. The one that we used was the disodium salt of 4'-sulfamidophenyl-2-azo-7-acetylamino-1-hydroxynaphthalene-3,6-disulfonic acid.

On April 20 a second transfusion, of 200 cc. of blood, was given.

The patient received sulfanilamile, 15 grains (0.97 Gm.) daily, from March 31 to April 5 and from the date of hospitalization, April 9, until April 19, when the daily dose was increased to 30 grains (1.94 Gm.). On April 25 the dose was reduced to 20 grains (1.29 Gm.) daily, and on May 2 to 15 grains (0.97 Gm.) daily until his discharge on May 5.

The temperature was not over 100 F. in the eight days prior to the patient's discharge. Both ear drums were healed, and the incisions were nearly healed when he was discharged.

TABLE 2.—*Findings in the Spinal Fluid*

Date	Cells	Polymorphonuclears, Percentage	Culture
4/19	4,300	92	Hemolytic streptococcus
4/21	1,300	88	Hemolytic streptococcus
4/23	730	86	Negative
4/25	240	65	Negative

COMMENT

One of the most interesting problems that this case presented was: When did the meningitis develop? When we did a spinal puncture on April 19, general well-being, associated with a septic temperature and the absence of signs of meningitis, made us think that we were probably dealing with thrombosis of a lateral sinus. The spinal puncture was done to determine if by compression of the jugular veins any obstruction of one or the other of the lateral sinuses, as shown by the spinal fluid pressure, could be determined. The finding of cloudy spinal fluid, which culture later proved to contain a hemolytic streptococcus, was a surprise to us. This caused us to wonder if when sulfanilamide is given it may partially control meningitis, so that one must suspect the presence of the disease when there is a septic temperature, even in the absence of the symptoms—rigid neck, Kernig sign, partial coma, etc.—which are commonly associated with this disease. Of course, it will take a long clinical experience with sulfanilamide to answer this.

SUMMARY

Two cases of meningitis of otic origin caused by a hemolytic streptococcus with recovery after the use of prontosil and sulfanilamide are reported.

We believe that in cases of this condition there should be as complete a surgical removal of the focus of infection as is possible.

We suggest the possibility that a moderate dose of sulfanilamide will partially control meningitis so that it will present a different clinical picture from the one with which physicians are familiar.

We were assisted in the treatment of these patients by advice from Dr. Perrin H. Long.

ETIOLOGY, PROPHYLAXIS AND TREATMENT OF SURGICAL SEPTICEMIA

A DISCUSSION OF THE PRINCIPLES INVOLVED

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Normally, the blood has a remarkable capacity for rapidly clearing itself of micro-organisms. At least, this has been abundantly proved experimentally with the lower animals when large numbers have been introduced directly into the blood, and it doubtless holds true for human beings as well. Furthermore, organisms, particularly streptococci of low virulence, may be intermittently present in the blood, as detected by cultures, when there is no clinical evidence of infection and especially in persons with chronic foci of infection about the teeth and tonsils. This constitutes bacteremia and probably occurs more frequently than is ordinarily surmised. However, when the blood is invaded by organisms of high virulence and the clearing mechanism is inadequate or fails, with possibly some actual proliferation and the production of toxins, this tissue may be regarded as being infected, which constitutes septicemia.

The same may occur with organisms of low virulence in persons of lowered resistance, that is, in persons of reduced clearing capacity.

Since such factors are of fundamental importance in relation to the etiology of septicemia, they may be discussed with more detail, especially since any knowledge physicians possess of the cause of septicemia is necessarily of fundamental importance in relation to its prophylaxis and treatment.

In the first place, virulence refers not only to the capacity of organisms for producing toxins but likewise to their invasiveness or their capacity for spreading rapidly in the tissues. As a matter of fact, organisms like the bacilli of diphtheria, tetanus and gangrene, which owe their virulence almost entirely to the production of powerful toxins in localized foci of infection, rarely produce septicemia. The most dangerous ones are those like streptococci and staphylococci, which not only produce toxins but are highly invasive. Under these conditions

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it would appear that septicemia is in most cases a result of loss of equilibrium, in which a rapid overflow of organisms from extensive or numerous foci of infection cannot be effectively balanced by the mechanism which removes them or in which a less rapid overflow results in a similar accumulation because the clearing mechanism is in some way put out of action, presumably by the toxins.

It is readily understood, therefore, that septicemia involves not only the matter of virulence on the part of the organism but, even more importantly, the state of resistance on the part of the host, which includes the capacity for removing organisms from the blood and for neutralizing their toxins.

The clearing mechanism is largely dependent on phagocytosis by the sessile histiocytes in such reticulo-endothelial depots as the liver, spleen and lymphatic glands, the polymorphonuclear leukocytes and the macrophages in the lungs. But this important phagocytosis, on the other hand, is largely dependent on certain antibodies in the blood, particularly the opsonins, which render organisms susceptible to phagocytosis, and also the agglutinins, which flocculate organisms into aggregates which are filtered off in the pulmonary capillaries and undergo phagocytosis.

Furthermore, a direct bactericidal action of the plasma plays a part in the clearing mechanism, owing not only to the activity of bacteriolysins aided by agglutinins but likewise to such nonspecific bactericidal agents as the leukins from leukocytes and the plakins from platelets. In addition, the presence of natural antitoxins appears to play a rôle, in the sense that neutralization of toxins results in less crippling of cells concerned in phagocytosis, which is of such primary importance in the whole mechanism.

No wonder, therefore, that surgical and biologic therapy continue to be of fundamental importance in relation to prophylaxis and, with the aid of chemotherapy, in treatment.

By surgical therapy I refer to adequate surgical drainage not only of the primary focus of infection but of the secondary embolic and suppurative foci, which are so likely to develop in streptococcic or staphylococcic septicemia in persons who survive sufficiently long for their development.

In other words, septicemia is not due as much to multiplication of bacteria in the blood as to constant invasion by organisms proliferating in the primary and secondary foci of infection. Therefore, the first principle in treatment should be the establishment of the best possible drainage of these foci. I realize that this requires the best of surgical judgment, because too hasty or too extensive operative procedures may break down the important walling off of the areas of thrombophlebitis

and lymphangitis of the local lesions as well as favor extension of infection into surrounding tissues. Nevertheless, prompt and adequate surgical drainage of the primary focus is of fundamental importance in both prophylaxis and treatment, along with eternal vigilance for the detection of secondary foci and their prompt drainage whenever possible, should septicemia develop.

By biologic therapy I refer to such measures as may be taken in aiding the clearing mechanism. As previously mentioned, this depends on phagocytosis aided by opsonins and agglutinins, bacteriolysis in which complement is required, antitoxins for the neutralization of soluble toxins and lastly such nonspecific agents as leukins and plakins, which possess some bactericidal activity.

For infections due to hemolytic streptococci of group A, which embrace those so likely to produce septicemia, I believe that the possible prophylactic administration of one or two intramuscular injections of from 10 to 20 cc. of concentrated antistreptococcus serum has been overlooked and neglected. Of course, no one wishes to administer such serum needlessly because of the danger of allergic sensitization, but without doubt all immune serums possess far more prophylactic than curative activity. In the case of concentrated polyvalent antistreptococcus serum, one may hope that it possesses sufficient antitoxin to help in protecting the phagocytes from the crippling effects of toxins besides furnishing sufficient opsonin and agglutinin for aiding the clearing mechanism should organisms gain access to the blood. In other words, its main function is to protect unaffected tissues. Therefore, I think it is excellent practice always and as a routine to culture material from primary foci at the time of operation and if hemolytic streptococci are found in cases in which septicemia is to be feared, to consider seriously prompt prophylactic administration of the serum.

In this connection, blood transfusion would also appear to be of prophylactic value in the way of furnishing the patient not only with additional healthy polymorphonuclear leukocytes and complement but with such natural antibodies as opsonin and agglutinin for aiding phagocytosis and, possibly, bactericidal antibody, including the nonspecific leukins and plakins. Therefore, the prophylactic value of one or more blood transfusions before or after operation should always be seriously considered, especially in cases of extensive infection and those in which general resistance is regarded as low by reason of prolonged infection and anemia.

Whether or not sulfanilamide (para-aminobenzenesulfonamide base) in tablets by oral administration or a soluble salt known as prontosil[1] by

1. The term "prontosil" has been applied to several preparations. The one referred to here is the disodium salt of 4'-sulfamido-2-azo-7-acetylamino-1-hydroxy-naphthalene-3, 6-disulfonic acid.

intramuscular injection possesses prophylactic value cannot be stated at the present time. But in hemolytic streptococcic infections the administration of these substances may be likewise considered, and it is my practice to give four intramuscular injections of prontosil in doses of 10 cc. each at twelve hour intervals followed by from 4 to 6 tablets of sulfanilamide orally per day for a week along with intramuscular injections of concentrated antistreptococcus serum or blood transfusions for prophylactic purposes in selected cases.

For the treatment also of septicemia due to hemolytic streptococci, I am in favor of the early administration of polyvalent antistreptococcus serum in large doses by intravenous injection every eight to twelve hours for at least four to six doses. Whenever possible the laboratory should test several antistreptococcus serums for agglutinating titer for the streptococcus recovered from cultures of blood; preference should be given the serum of highest titer, for it is always likely to contain more opsonin and antitoxin as well. Of course, the necessary precautions against allergic shock must be taken, including its slow administration after dilution with two or three volumes of sterile saline solution. Unfortunately and altogether too frequently, its administration is delayed too long, and in advanced stages it is without benefit. As with all immune serums, including the antitoxins, the keynote of therapeutic efficacy is in early administration of large doses.

Unfortunately, there is no equally efficient serum for treatment of staphylococcic septicemia, but I am favorably impressed with the occasional therapeutic benefit attending the intravenous administration of bacteriophage, provided one is obtained which is found in the laboratory to be actively lytic for the staphylococcus recovered in cultures of blood. Indeed, I believe that its administration should always be included in the treatment of this highly mortal type of septicemia, as part of the therapeutic program.

However, whether or not the serum or bacteriophage is administered, transfusion of from 200 to 300 cc. of blood every three days should be given as a routine and as early as possible, not so much for supplying erythrocytes and hemoglobin as for furnishing healthy leukocytes as well as complement, opsonin, agglutinin, leukins and plakins. In securing blood for patients with streptococcic septicemia preference should be given to such compatible donors as have had surgical streptococcic infections or scarlet fever, because of the increased chances of furnishing the hard-pressed patient with specific antibody. In this connection, I may state that I am much in favor of the practice of Baun of selecting from the available donors the one whose blood serum shows the largest content of agglutinin for the streptococcus recovered from the cultures of blood, because, as previously stated, agglutinin favors the clearing mechanism in the way of promoting phagocytosis and bacteriolysis

and its presence also indicates the possible presence of opsonin and other antibacterial antibodies. Furthermore, it would appear that nonspecific immunotransfusions may be of more value than ordinary transfusions, at least from the theoretical standpoint. These consist in giving the donor intravenous injections of typhoid vaccine containing from 50,000,000 to 100,000,000 killed organisms and using the blood several hours later, after subsidence of the reaction of fever and chills. Under these conditions, the blood of the donor carries more leukocytes of probable value to the patient as well as possibly more leukins, plakins, opsonins and other antibacterial factors. Unfortunately, in a case of acute septicemia there is not sufficient time for the immunization of donors with repeated subcutaneous injections of a vaccine of the organism infecting the patient, but this is always advisable in a case of staphylococcic septicemia, since the patient is likely to require transfusions over a considerable period.

Unfortunately, none of these measures except surgical drainage is at all likely to reduce materially the degree of infection in the primary or secondary foci of infection in the fixed tissues. Biologic therapy only aids the clearing mechanism, and the treatment of septicemia will never be satisfactorily solved until chemotherapeutic research reveals a compound capable of disinfecting the fixed tissues with all the efficiency of the arsphenamines in the destruction of Spirochaeta pallida. No wonder, therefore, that the chemotherapy of septicemia has largely been a disappointment despite isolated case reports alleging or intimating that recovery was due to the administration of this or that chemical agent. Luckily, however, it would appear that in sulfanilamide a chemical agent of real value has been evolved for the treatment of infections due to the beta hemolytic streptococcus, as the compound has proved clinically of encouraging value, probably by reason of promoting phagocytosis. It is of low toxicity and is usually well borne. The soluble prontosil [1] is dispensed as a 2.5 per cent solution for intramuscular (preferred) or intravenous injection; prontosil tablets [2] are but feebly soluble and are dispensed orally in doses of 5 grains (0.32 Gm.) each. My present practice is to administer these compounds every six hours as follows until the blood cultures are sterile:

1 to 5 years	2 cc. intramuscularly, ½ tablet orally
6 to 15 years	5 cc. intramuscularly, 1 tablet orally
Adults	10 cc. intramuscularly, 2 tablets orally
or	20 cc. intramuscularly, 1 tablet orally

As soon as sterile blood cultures are observed, along with clinical improvement, I stop the intramuscular injections, but I continue to give the tablets for from one to two weeks.

2. Prontosil tablets are the hydrochloride of 4′-sulfamido-2,4-diamino-azobenzene.

For staphylococcic septicemia, however, there is not yet available a chemical agent of equal value, although it is my custom to give from 10 to 20 cc. of Pregl's solution of iodine or similar doses of a 1:1,000 solution of metaphen every twelve hours for at least four to six doses because of individual cases in which I had reason to suspect that these compounds were at least helpful.

It is readily understood, therefore, that there is not yet a royal road to the treatment of surgical septicemia, involving as it does, a judicious combination of surgical intervention, biologic therapy and chemotherapy. Furthermore, certain general measures always require careful consideration; among these may be mentioned the advisability of keeping the tongue moist by sufficient intake of fluids (about 3,000 cc. per day for the adult), including the administration of dextrose (preferably a 5 per cent solution by bowel in order to spare the veins), the relief of distention by turpentine stupes or solution of posterior pituitary; the administration of whisky or brandy, preferably in egg-nogs, and the administration of digitalis, strychnine or other cardiac stimulants, as well as the important matter of insuring adequate rest for the patient. To this end the therapeutic program should be carefully outlined each day and morphine should be given subcutaneously as required, since this is far better practice than to allow a restless patient in pain or distress to reach a stage of exhaustion.

SUMMARY

1. Normally the lower animals and human beings are protected against bacteremia and septicemia by a remarkable mechanism for clearing the blood of invading organisms through phagocytosis on the part of leukocytes, the histiocytes of the reticulo-endothelium and the macrophages of the lungs, aided by opsonins and agglutinins.

2. Additional factors in this antibacterial immunity are the natural antitoxins, bacteriolysins and such nonspecific agents as the leukins and plakins.

3. Septicemia is the result of virulence of the infecting organism, a deficiency on the part of the clearing mechanism or a combination of the two.

4. Virulence refers not only to the production of toxins but to the capacity of the organism for invading the fixed tissues and the blood.

5. In both the prophylaxis and the treatment of surgical septicemia adequate but skilful and judicious surgical drainage of the primary and secondary foci of infection is of paramount importance.

6. Prophylaxis may be aided by the intramuscular injection of antistreptococcus serum and particularly by blood transfusions before or after surgical operation, as well as, possibly, by the administration of sulfanilamide or one of its derivatives.

7. Biologic therapy plays an important part in the treatment of surgical septicemia and includes the early administration of large amounts of antistreptococcus serum or staphylococcus bacteriophage by intravenous injection as well as by transfusions of normal or immune blood every three days.

8. Sulfanilamide (para-aminobenzenesulfonamide base) by oral administration and a derivative, prontosil, by intravenous or intramuscular injection are recommended for the chemotherapy of septicemia due to the beta hemolytic streptococcus, and Pregl's solution of iodine and metaphen by intravenous injection, for staphylococcic septicemia.

9. Important adjuvant measures embrace adequate intake of fluids, administration of dextrose, relief of distention, and sedation with morphine.

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SMALL DOSES OF INSULIN IN OTOLARYNGOLOGIC PRACTICE

CLINICAL EXPERIENCE OF A CORRESPONDENCE STUDY GROUP

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INTRODUCTION

The natural sequence of events following the introduction of any new therapeutic agent or method has plotted a similar course throughout the history of medicine. Characteristic of medicine today is its insistence on rationalization, but equally important for advancement is the empirical trial of drugs and methods in conditions other than the ones for which they were originally intended. The widespread use of fever therapy, the treatment of lobar pneumonia with pneumothorax and the administration of the arsenical preparations in conditions other than syphilis are but a few examples of this tendency.

It is therefore not surprising that the introduction of a drug so spectacular in its specific effect as is insulin should occasion its trial in many conditions other than diabetes mellitus, for which it had been sought for years.

The present knowledge regarding its physiologic activity has been derived largely from two main sources. These two sources are observations of its effect on diabetic persons and experiments on animals. Experience with small doses of insulin is showing that deductions from one or both of these sources of information cannot always be applied to the normal nondiabetic patient and that the sum of knowledge is not yet sufficient for interpretation of all observations.

SIZE OF DOSE

The dose of insulin must be small, so that no epinephrine will be discharged from the adrenal glands. The interval between doses must be of such length that clinical progress is maintained. Large doses of insulin produce edema, while small doses cure it. When small doses of insulin are given over a period of months, if slight edema of the tissues appears it is an indication either to lengthen the interval between doses or to reduce the size of the dose.

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As to the size of the dose in this new found use of insulin, 5 units constitutes a maximum dose, 1 unit a minimum dose and 3 units the average dose. Five unit doses are rarely used. Three units is the usual dose. It is given subcutaneously each day if the clinical need is great. As clinical improvement takes place, the interval between doses is lengthened to every other day and later to Tuesdays and Fridays or a similar interval. When insulin is given over a period of months, the 3 unit dose is eventually given once a week.

GENERAL CLINICAL CONDITIONS IN WHICH SMALL DOSES OF INSULIN HAVE BEEN FOUND TO BE OF VALUE

The list of conditions in which members of the group have found that the use of insulin brings clinical results is a long one. These are: 1. Any break in surface tissue, either skin or mucous membrane, such as ulcer of the cornea, syphilitic ulceration of the throat, bed sores in the aged, ulcer on the leg or wounds for which rapid healing is desirable. 2. Disturbance of the water balance of the body, as indicated by a watery discharge from the nose, edema of the pharyngeal or laryngeal region, edema of the ankles, puffiness of the eyelids or angioneurotic edema. 3. Mucopurulent or purulent discharge from the ears or the paranasal sinuses, postnasal dripping, pulmonary abscess or infected wounds. 4. Blood clots, such as those caused by cerebral hemorrhage, retinal hemorrhage, hemorrhage of the bulbar conjunctiva or hemorrhage into the anterior chamber of the eye, insulin hastening absorption. 5. Disturbance of circulation, such as that in Raynaud's disease.

This list of clinical conditions is long and broad in its scope and brings to mind the question as to what underlying clinical fundamentals one is observing when one secures clinical results in so many types of clinical condition from the use of small doses of insulin given subcutaneously. The answering of this question brings one to a consideration of the theory of oxygen metabolism.

THE THEORY OF OXYGEN METABOLISM

1. The theory of oxygen metabolism is based on the assumption that the central problem in medicine is not one of infection but one of oxygen metabolism.

2. Sixty-five per cent of the elementary composition of the human body is represented by oxygen, which indicates its importance. The remainder of the elementary composition of the human body is represented by minerals.

3. Oxidizing catalysts required by the body are taken in as minerals, found chiefly in fruits, nuts and vegetables.

4. A lack or insufficient intake of oxidizing catalysts results in a block in the carbohydrate oxidizing chain.

5. The body in order to overcome this block in oxygen metabolism breaks down tissues to obtain the desired minerals which are normally present in its composition.

6. This breaking down of body tissues to secure the necessary minerals with which to carry on oxygen metabolism is made known clinically by the appearance of albumin, sugar, pus or all three in the urine, a change in the normal secretion from the mucous membrane, the appearance of a purulent discharge in various parts of the body and loss in continuity of tissue, as seen in ulceration.

7. The presentation of oxidizing catalysts to the body in the form of small doses of insulin, thyroid, dilute hydrochloric acid, iodine, and fruit and vegetable juices for their mineral content generally results in disappearance of albumin and sugar from the urine, return to normal of the secretion from the mucous membrane, disappearance of a purulent discharge when it is present in various parts of the body and healing of a break in the continuity of tissue.

CLINICAL APPLICATION OF THE THEORY OF OXYGEN METABOLISM BY MEANS OF SMALL DOSES OF INSULIN GIVEN SUBCUTANEOUSLY

The Common Cold.—Prevention: In dealing with the common cold one needs to appreciate the fact that there are ten different varieties and that some of these ten are due to environmental conditions directly controllable by the patient. Other than these, the common cold may be prevented by giving 3 units of insulin subcutaneously every ten to fifteen days, depending on how susceptible the person is to colds, and including in the diet foods representing a good source of iodine, iron, copper and manganese, the four best oxidizing minerals. Because they require oxidation in the body, the intake of carbohydrate foods is kept low in order to lessen the load of oxidation.

Relief of Symptoms: When a patient has a common cold, he comes to the office once a day for three days. Each day he is given 3 units of insulin subcutaneously. As beef and pork insulin are both on the market, he is asked if he is sensitive to either beef or pork. If sensitive to one, he is given insulin prepared from the other.

As a rule, the first treatment will bring about 50 per cent improvement. The second treatment will generally complete the relief from symptoms, but a third treatment is given to make sure of the results desired. By the use of oxidizing catalysts, such as small doses of insulin and a low intake of carbohydrate food to be oxidized, the common cold in the majority of cases may be limited to twenty-four or forty-eight hours' duration.

Secretion Within the Nose.—Dried secretion within the nose and mucopurulent threadlike bridges extending from the nasal septum to the outer wall of the nose are present when the carbohydrate intake is greater than the patient can oxidize into heat, energy, water and carbon dioxide.

If the patient is annoyed by the presence of dried secretion within the nose and the necessity of always carrying a handkerchief for the blowing of the nose that is required from time to time, 3 units of insulin given subcutaneously each day will clear up the abnormal secretion within the nose in from one to three days. Reduction in the intake of food requiring oxidation will maintain the improvement within the nose and allow the use of insulin to be discontinued.

Nasal Polypi.—Three units of insulin given at intervals such as Tuesdays and Fridays represent will dehydrate nasal polypi. So far as dehydration will result in improvement, improvement will come. Recently developed polypi will disappear from the nose, but if a polypus is well organized, insulin will not reduce its size, an operation being necessary for its removal.

Acute Otitis Media.—My own interest in the relation of small doses of insulin to acute otitis media was aroused when Dr. Nan L. Gilkerson, of Amarillo, Texas, sent me a letter for the group in which she wrote in part, as follows: "My use of 3 unit doses of insulin in the treatment of infections of the middle ear during the swimming season has been successful." This letter brought with it a desire to try out 3 unit doses of insulin in acute otitis media.

On Sept. 19, 1935, a farmer about 30 years of age came to the office early in the day, stating that he had been having a head cold for the past few days and that earache in the right ear had developed during the previous evening. This pain became so severe that during the night he required an injection of morphine to secure enough relief from the pain to enable him to pass the night. He stated that the night was passed without sleep. At the time of his visit to the office, the pain in the ear was still severe. Examination showed a bulging and reddened ear drum. All the classic indications for paracentensis were present: extreme pain, extreme bulging and extreme redness. It occurred to me that a better case could never be had to test whether insulin in small doses is of value in acute otitis media. Nothing was done to the ear except to instil a thin nasal spray oil as a placebo. He was given 3 units of insulin subcutaneously in the arm. For home use, he was given the same oil to be instilled in the ear every two or three hours and "pain pills" each containing 3½ grains (0.22 Gm.) of acetylsalicylic acid, 1 to be taken every three hours.

The following morning he returned to the office and reported that with the help of the pills he had been fairly comfortable since his first visit to the office. Examination of the ear, much to my surprise, showed that the bulging was all gone and about 50 per cent of the redness of the ear drum had disappeared. Three units of insulin was again given subcutaneously. I told him to see me the following day, September 21, if his pain returned and was severe

but to be sure to return to the office on September 23 for a check-up of his ear. I did not see him until September 23, at which time he stated that his ear had been comfortable. Examination showed a normal ear drum, with the exception of a slight redness of Shrapnell's membrane. I tested the hearing in this ear and found that he could hear a whisper at 20 feet (6 meters) the same as he could with the other ear.

I concluded that this result had just happened and could never be repeated, but on Sept. 20, 1935, a young married woman came to the office with the same clinical symptoms. A head cold was followed by severe pain in the ear, with bulging and redness of the drum head. Again, 3 units of insulin was given subcutaneously in the arm together with a thin oil to use in the ear as a placebo and the aforementioned "pain pills."

The following day, September 21, she reported at the office stating that while the pain had not wholly disappeared, it was bearable with the aid of the "pain pills." Again bulging of the drum head had disappeared and the redness had diminished. She was given 3 units of insulin subcutaneously and did not return to the office until September 24. At this visit she stated she had been free from pain since the visit on September 21, but that the ear felt uncomfortable and she feared lest pain might return and therefore she came to the office. The drum head showed a slight amount of redness in the posterior inferior quadrant, but the cone of light was present. With this ear she could hear a whisper at 15 feet (4.5 meters). She was given 3 units of insulin subcutaneously and was requested to return to the office if her ear continued to trouble her. She did not return.

Chronic Suppurative Otitis Media.—Dr. Henry Goodyear, of Cincinnati, wrote me as follows:

I have found small doses of insulin helpful in stimulating recovery in chronic infections. Recently, I had a patient aged 49 with a central perforation of the ear drum and constant mucopurulent discharge from the ear for two years. She had been treated without relief. I tried treating her for eight weeks without any improvement resulting. Finally, I gave her 5 units of insulin. She returned to the office five days later, stating that the ear was dry for the first time in two years. This happened six weeks ago, and the ear had remained dry. This may have been only a coincidence. I can scarcely see how one injection could turn the tide.

This observation of Dr. Goodyear's is similar to those I have made in my own practice.

The first case in which this happened was that of a high school student who came to the office with a discharge from both ears, which developed during an attack of influenza. A reduction in the intake of carbohydrates plus dry treatment with wicks in the auditory canal and iodine by mouth each day dried up the discharge from the right ear and diminished the amount in the left ear. In addition, Sulzberger's powder (boric acid and iodine) was used in the left ear. Finally, when failure to bring about disappearance of the discharge by local treatment seemed evident, I decided to try 3 units of insulin given subcutaneously in the arm. Three days later, the ear was found to be nearly dry. Three units of insulin was given on Oct. 11, 14, 17, 22, 25 and 28, 1935. On October 28 both ears were dry, with hearing for a whisper at 20 feet (6 meters) in both ears. I checked up

the condition of this patient at the opening of school in 1936. Both ears have remained dry since October 1935. A whisper at twenty feet (6 meters) can still be heard in both ears.

Dr. Frank M. Adams, of Providence, R. I., wrote:

Commenting on the group letter, page 1192-1193, relative to acute rhino-otologic infectious processes, let me tell you about my experience with insulin in my own family, in which we have three diabetic children.

In the presence of acute infection of the throat, nose and ears, an increased dose of insulin has been responsible for a practical abortion of all symptoms in twenty-four hours. This observation covers about eight years for the three patients. They have not been away from school or college one single day in that time and have faced several severe endemic and epidemic visitations in these eight years. Insulin definitely has the power of increasing resistance to infection.

Furuncle of External Auditory Canal.—Small doses of insulin subcutaneously in the arm are of real value in furuncle of the external auditory canal. Their use shortens the duration of this clinical condition and aids in preventing the appearance of additional furuncles. The insulin is given at first every day until the furuncle is under control, then every other day as long as is necessary.

Dizziness.—In patients complaining of progressive loss of hearing with dizziness, 3 unit doses of insulin, subcutaneously, every four days will generally relieve the dizziness in from two to four weeks.

Edema.—I shall turn my attention briefly to the influence of small doses of insulin on edema of the pharyngeal and laryngeal region.

The following case report was sent me by Dr. Fred Hill, of Waterville, Maine:

Since returning from the meeting in Charleston, S. C., I have been looking for an opportunity of using insulin in the treatment of laryngeal edema. Recently, I have had this privilege. I was called in consultation to see a patient in another hospital because of edema of the throat and larynx following streptococcic infection. He showed marked edema of the uvula extending up in the soft palate and the lateral pharyngeal walls. There was less edema of the epiglottis and the aryteno-epiglottidean folds. When I saw him, the glottis itself was fairly free. I suggested the use of insulin as well as scarification of the uvula. Several hours later, I was called again, and on examining the uvula found evidence of just two slight incisions on the right side. I advised further scarification. As the patient objected, I did not insist, thinking that I would see what the insulin alone would do. The next day, I received the report that the edema had markedly subsided and the patient was comfortable. This was after two doses of 5 units of insulin.

Dr. John Pratt, of Minneapolis, Minn., sent me the following case report:

Mr. D. T., aged 27, had recently had acute edema. The nose and the nasopharynx were entirely closed, and the eyelids, upper lip and cheeks were greatly swollen. The uvula was about the size of a thumb. Sodium bicarbonate and iodine

and 4 units of insulin were given when he came in the morning, and he went to work in the afternoon. The next morning when another 4 units of insulin was given, the swelling of the face had practically gone and he could breathe a little through his nose. He was told not to return for three days if he continued to improve. When he returned, he was entirely normal.

Dr. John G. McLaurin, of Dallas, Texas, sent me the following statement:

Miss M. W., aged 20, was examined first on May 4, 1936. The history stated that she had been suffering from influenza for the past three weeks, but for three days her throat had been gradually swelling to the extent that it was almost impossible for her to breathe and she had been unable to swallow food for twenty-four hours prior to the time she saw me. She had had a rather high temperature for the past three days, though it was only 101 F. at the time she came to my office. The respiratory rate was about 36, and each inspiration was short and difficult. Her throat showed slight edema of the glottis and the tonsil pillars. The tonsils had been removed cleanly. The glotto-epiglottidean sulcus was obliterated by swelling, and the free border of the epiglottis could be seen as a sunken line of attachment of the membrane, which was swollen on both the anterior and the posterior surface so markedly that it extended above the free border. The right aryepiglottidean fold was so swollen that it was impossible for me to see the small chink through which she was breathing. There was no ulceration in the larynx or in any part of the throat. Her nose showed a general redness of the membrane, with some mucopurulent secretion postnasally. Cultures were taken on brain broth and blood agar, and a growth of chain streptococci was noted in the brain broth.

The patient was sent to the hospital from my office, and 5 units of insulin was given every twelve hours. She was given chipped ice by mouth, and an ice bag was placed on her throat. I would have been perfectly justified in doing a tracheotomy when I first saw her. The color was good, and I decided that I would see what could be done by the use of insulin. No dextrose was given to her intravenously. Within twelve hours from the time the first dose of insulin was given, she was better, and within twenty-four hours she was apparently on safe ground, though there was some edema, which gradually subsided over four days. By following this plan of therapy, I got an excellent result and a quick response in controlling the edema. This was an interesting case for me, and I feel that insulin unquestionably cured this patient.

Ulceration of Throat.—Dr. Francis B. Blackmar, of Columbus, Ga., sent me the following report:

Since my return from the meeting of the American Laryngological, Rhinological and Otological Society, in Charleston, S. C., I have been fortunate enough to be allowed to treat a most interesting patient. This patient had a 4 plus Wassermann reaction, tremendously enlarged cervical glands and a hole sloughed out in the region of the tonsil dangerously near the greater vessels of the neck. Antisyphilitic treatment apparently had no effect. He had recently had a severe hemorrhage from his throat, and from what I learned from his family physician, he had come very near bleeding to death. I have seen him for about a week at the time of writing, and in this time, with the addition of 3 units of insulin to the treatment, the foul ulcer has cleansed itself, leaving a red surface. At the last visit, the ulcer was healing rapidly.

Insulin in 3 small doses is of value in treating ulceration in other parts of the body, such as corneal ulcer, ulcers of the leg and bed sores.

SUMMARY

1. Insulin in small doses, averaging 3 units, acts as an oxidizing catalyst. Oxygen metabolism influences the behavior of the autonomic nervous system. An effect on the parasympathetic nervous system is secured, the insulin apparently blocking off the sympathetic division.

2. Insulin in small doses generally limits the duration of a common cold to twenty-four or forty-eight hours.

3. Insulin in small doses is of value in influencing secretion from the mucous membrane, in dehydrating nasal polypi and in relieving acute otitis media and chronic suppurative otitis media.

4. Insulin in small doses is of value in treating ulceration of the tissue.

107 North Main Street.

DYSPHEMIA AND DYSPHONIA

CARDINAL FEATURES OF THREE TYPES OF FUNCTIONAL SYNDROME: STUTTERING, APHONIA AND FALSETTO (MALE)

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The conditions of dysphemia and dysphonia which I am about to discuss, although definitely dissimilar in their clinical aspects, are similar in other aspects. For example, all these conditions—stuttering, hysterical aphonia and paraphonia (falsetto voice)—indicate individual biologic inadequacies, that is, basic constitutional or organic inferiorities. Furthermore, the etiology, or the more immediate origin of the symptomatology, is psychologic, while the expression is physiologic.

The conduct, affects, attitudes and productions of these patients lead one to conclude that their psychologic functioning is unique in many important respects. Their subjective sense of values differs from that of the average person. Hence, their reactions are both qualitatively and quantitatively different.

These differences strike one frequently as differences in emotional threshold, special psychosomatic dispositions serving as the foundation for deviations in emotional attitudes in later years.

As far as physique is concerned, there is no difference between a person suffering from stuttering and one suffering from aphonia. However, on the basis of my experience, in the case of the falsetto voice there is a distinct variation as to type. According to Kretschmer,[1] there are three major physical types: asthenic, athletic and pyknic. In addition to these three principal types, there is also a fourth, the dysplastic, which includes many digressions from the average, based chiefly on endocrine changes and resulting in disproportions. A recent study of

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1. Kretschmer, E.: Physique and Character, translated by A. Sprott, London, Kegan Paul, Trench, Trübner & Co., 1925.

12 of my cases of falsetto voice showed the following distribution of body types:

Asthenic	3
Athletic	0
Pyknic	2
Dysplastic	7
Asthenico-Pyknic	
Asthenico-Eunuchoid	
Pyknic mixture	
Eunuchoid	

Thus, the predominant type is dysplastic, that is, a composite of the asthenic, pyknic and eunuchoid.

However, regardless of type, and although the adult male with a falsetto voice may show a tendency toward femininity, there are no anomalies of the genitalia, either anatomic or physiologic.

In regard to the etiology of stuttering, aphonia and falsetto voice, an anxiety state is an essential etiologic factor, particularly in the first two conditions, and psychologic investigation and treatment are clearly indicated. All three conditions are precipitated by special happenings during development or later in life. The responsiveness of the motor act varies with the degree of emotional balance present and offers objective evidence of the functional activities experienced by the person. States of increased emotional tension—emotional imbalance—are always associated with increased functional activity. Mind expresses itself in muscular and nervous responses. There is evidence that the mechanics of emotional balance are largely contingent on the balanced opposition of the parasympathetic and sympathetic divisions of the autonomic, or vegetative, nervous system. Because of the multiplicity of the functions of the autonomic system, an imbalance in this delicately adjusted apparatus may destroy the physiologic equilibrium between the two divisions and may produce a great variety of symptoms.

I shall first consider stuttering. At present, among the different workers in the field, there is increasing unanimity that the one outstanding somatic finding is marked instability in the functioning of the vegetative nervous system, with special dysfunction of the vasomotor apparatus. Professor Seemann,[2] reporting a study of 260 stutterers, stated that he found an imbalance of the vegetative nervous system in 88 per cent of the subjects. Thirty-six per cent demonstrated sympathetic dominance; 18 per cent showed parasympathetic dominance, and 34 per cent showed evidences of increased tonus in segments of both branches of the vegetative nervous system, or amphotonia.

2. Seemann, M.: Somatic Findings in Stutterers, Monatschr. f. Ohrenh. **68:** 895 (Aug.) 1934.

These deviations in the neurologic functioning of the stutter type person are manifest in his disorganized muscular coordinations. These incoordinations may appear in any neuromuscular activity and in many psychomotor patterns, but the fundamental characteristic is a lack of rhythm in performance. In other words, the stutter type person lacks harmony; he is out of tune, both neurologically and emotionally, and unequal to the strenuous tempo of life.

The respiratory tract is dominated by the parasympathetic division of the vegetative nervous system, and in the condition under consideration there is a continual conflict as to dominance, a mutual antagonism, going on between the parasympathetic and the sympathetic characteristics which the person possesses. For instance, under stress the stutterer, although a parasympathetic type, is rocketed to hypersympathetic dominance. He loses the proper balance in maintaining the physiologic functions of the vegetative nervous system, so that the excitation—the emotional state—engendered, for example, by a special examination of the nose and throat, will readily change his usually pale mucous membrane to pink or red. This is a physiologic alteration in the tonus of the peripheral vessels, a state of congestion, with no other local findings, and it can be observed for long periods.

The stutterer, or the stutter type person, as I designate him, thus falls into a special category. He suffers from a type of neurosis which one may term a "social neurosis." His abnormal response to environmental impacts is pronounced. He demonstrates strong excitation and a tendency to quick interruption or inhibition, accompanied by a high emotional tone, in social situations. On account of his special constitutional makeup, he is predisposed to acquire specific neurotic traits, provided a neurotic environment is present to stimulate the creation of the neurosis with its myriad symptomatology.

The stutter type person is a chronic hesitator and may demonstrate his hesitating performance not only in speech but in many other forms of psychomotor activity. However, since the neuromuscular coordinations involved in speaking are of a highly complex and delicately balanced nature and because speech is so necessary for normal social adjustment, the involvement of the speech faculty in this stutter type syndrome is a far more serious problem than stuttering or chronic hesitation in other muscular activities.

Because of the high emotional tone of the stutter type person, stuttering speech, with its usual history of humiliation, failures and frustrations, eventually leads to the development of an anxiety state regarding speech and maladjustment of the entire personality.

Not only does the stutterer demonstrate anticipatory anxiety and lack of emotional control in given situations, but almost always he is unable to throw off the effects of these situations after they have been

experienced. He becomes self-centered and oversensitive. His self-esteem is easily hurt, and his life is dominated by introversion and evasion, frequently accompanied with an assumption of superintellectuality, with which he consciously or unconsciously cloaks his feeling of inadequacy.

Since I view stuttering primarily as a physical manifestation of psychic conflict, with the high emotional energy of the stutterer turned in the direction of a fear which warps his entire personality, I have arranged a composite therapy of a medical, social, psychiatric and psychologic nature. This composite therapy is directed toward the integration of the stutterer's vital personality drives with a view to placing them in their proper relationship. As the stutterer's difficulty is one of social adjustment, these personality problems are worked out in a group medium, which I term open door psychiatry.

While the symptom stuttering is merely of secondary importance, I find a certain amount of speech reeducational work helpful. Technical faults respond to reeducational procedures, not to theoretical discourse alone. However, and this is of the utmost importance, throughout the treatment interest must be focused on the total personality of the patient.

The same general type of physical dysfunction due to psychic influence is seen in the person suffering from hysterical aphonia. It is not merely a question of treating the local involvement but a question of treating the *whole* personality in order to counteract the physiologizing of the emotions, with its resultant aphonia.

The following excerpt from a letter written by a woman of 28 gives an excellent example of the physical and emotional manifestations of hysterical aphonia:

> I was wondering if you have ever come across anyone with the same peculiarity that I have. I am able to speak, but only in a whisper, and have been like this for the past four or five years. At the present time I am unable to talk at all and I have to resort to a pencil and paper as a means of communication. My voice comes back at intervals for a week or a month, but then goes for a year or so.
>
> I was a stenographer, but have been out of work for several years. My parents have done everything suggested by our doctor and my throat specialist. I have had lamp treatments, have had several x-rays taken, have had my tonsils removed, and have had a complete rest. I seem better for a while; then my voice goes for another year or so. The specialist says my throat is normal, and he can see no reason why I cannot speak, but the fact remains that I cannot.
>
> Lately I am beginning to find it very hard if I attend large gatherings where there are many people or much noise; trying to make myself understood seems to tire me very much and tends to make me sick all over.
>
> My friends and acquaintances have no difficulty in understanding me, but other people do. It is a handicap when I am in an office, because I cannot answer the telephone. Persons hearing me for the first time as a rule comment on my very bad cold . . .

This letter, besides giving an excellent description of the objective and subjective symptoms, also mentions the typical list of physical therapeutic measures usually instituted, in many instances without avail. The reason for their futility is that the inhibition of the voice originates in the psyche and is not a local physical expression of a pathologic nature. Incidentally, since the mechanism of the disorder is unknown to the patient, it is difficult for her to realize her true status; hence she views her condition as a purely physical one and seeks physical aid.

Therapy to be effective must be directed to the elimination of the etiologic factor. The fear that inhibits the voice may be very difficult to ferret out, and it generally has a long chain of painful associations. It may be the result of long-suppressed hostility, feelings which have grown in magnitude and which overwhelm the sufferer and inhibit expression. Again, feelings of guilt and ideas of punishment, shame and embarrassment, inadequacy and inferiority may lead to the suppression of the voice. The modus operandi that produces the final result, as pointed out, is the involvement of the vegetative nervous system.

The third symptom complex is paraphonia, or falsetto voice. Perhaps the best way to introduce this subject is by means of another letter which gives a lucid description of the condition:

> For over twenty-five years I have suffered the torments of the damned because of my voice. I am now over 40, married and the father of three grown children. My voice is high pitched, thin and piping like a woman's. I try to talk in my throat to disguise it as much as possible, until I have a superinferiority complex. Afraid to meet people, I shun all meetings and social activities. I have become disheartened and discouraged. I feel miserable every minute in the day and am looking forward to a ray of hope from you.
>
> I am very sensitive about my voice, and a "man of few words" when I am in contact with people. All through high school I lived in a nightmare. I stammered in addition to having the high voice, and you can imagine my feelings.
>
> Is there any hope of readjusting my speaking voice so I can assume my place in society? I realize the voice is the mouthpiece of personality, and I have been kept confined like a hermit when I want to do things and realize my ambition of leading a real, normal life. I know I could face the world and achieve my ambition if I only had a deep, normal male voice.

This letter, like the other, gives an excellent description of the objective and subjective symptoms. It refutes the popular fallacy of doubtful sexuality, since the patient has three children. This general erroneous point of view is decidedly humiliating and psychically detrimental to the person and arises from the fact that a falsetto voice is characteristic of the eunuch or the eunuchoid.

Eunuchoids are persons who without being castrated entirely simulate in clinical manifestations the true eunuch type. This condition is due to a developmental disturbance beginning primarily in the sexual glands. One of the symptoms is a change in the pitch of the voice,

which becomes high. On account of this similarity, the term eunuchoid voice has been used synonymously with falsetto voice. Therefore, the use of this term has given rise to much misunderstanding, which is unfortunate for the patient having a falsetto voice. A falsetto voice of an adult male who is not a eunuch or a eunuchoid does not depend on imperfect genital development but in practically all cases is the result of a faulty habit contracted by the subject at the time of the change of voice and retained in after life.

Physicians are all familiar with the common physiologic changes that take place in children during puberty. Concomitant with the general systemic changes, there also occur mutations in the larynx and the voice. The larynx, through the change in the shape of the thyroid plates, grows forward so that there is greater prominence of the part which is commonly designated as the Adam's apple, this change being less marked and more gradual in the female. Measurements of the neck indicate that the position of the larynx is a little higher in females than in males. The vocal cords in males during this development become more elongated than those in females; this, plus the change in conformation, explains why the male voice is of a lower pitch and usually stronger. The pitch of the voice depends on the number of vibrations the vocal cords make during a second, and the number of vibrations depends on the length and width of the aperture through which the air passes, plus the degree of tension of the cords. The longer the cord, the less tension; the wider the glottis, the lower the voice.

The period of mutation of the voice is irregular in both boys and girls. Girls' voices break less often than boys' and gradually become fuller and more resonant. Boys' voices, after frequently breaking for a considerable period, finally become lowered about an octave. The mutation is sometimes gradual, sometimes rapid. A child may be slightly hoarse for a few days or weeks, and then the voice becomes standardized, or it may take a number of years before a permanent change takes place.

During mutation the successive changes in the form and size of the larynx take place so rapidly that proper realization of the changing conditions of tension is lost, and many bad vocal and speech habits may be contracted. The voice may become coarse or throaty, nasal, aspirate, guttural or growling, or it may continue in a childish treble. Articulation often suffers, and pronunciation is slovenly. Objectively, the larynx, irrespective of the vocal cords, sometimes shows slight hyperemia, which in itself is sufficient cause for the raucity of the voice. Often there is a disproportion in growth of the vocal cords and cartilages to which the cords are attached, resulting in unsteady tension of the cords, which is instrumental in producing a voice that occasionally breaks

to a childish treble. At this period also a misdirection of afferent impulses may result in the abuse and nonuse of certain sets of muscles, antagonistic in action, that come into play during voice production. This causes partial vibration of the vocal cords, impairment of resonance and misplacement of the larynx, so that it is seen in an abnormally high position. The voice emanating from such a larynx is high pitched, thin and piping—a falsetto voice.

A falsetto voice is often reckoned to the head register, its volume and area being almost as large as those of the chest register. It is of a thin, shrill quality, sounding forced or unnatural, and, as its name implies, is a false voice. In brief, it is a child's voice produced by an adult, originating at that period of life when physically the boy or girl is a man or woman in everything but voice. This voice suggests a lack of muscular control besides a disturbed balance in the respiratory act.

Of the various reasons given for the occurrence of this faulty voice condition, a disproportionate action of the laryngeal muscles, which is the end-result of a long chain of etiologic factors, usually accounts for the trouble. The larynx is poised in the correct position for speaking or singing through an equalized tug that goes on between the levator and the depressor muscles. If for some reason the pull on the depressor muscles is stronger and the larynx is lowered from its normal position, the voice assumes a heavy and unnatural low pitch. On the contrary, if the pull of the levator muscles is stronger and the larynx is raised high in the throat, the voice assumes a thin, high pitch. With this there is an abnormal action of the intrinsic muscles of the larynx; the tension between the cricothyroid and the thyro-arytenoid (vocalis) muscles is irregular, so that interference with the complete vibrations of the vocal cords takes place, the cords only partially vibrating. These changes necessarily produce a disturbance of the normal resonance, which in turn results in a disturbance of the voice.

These patients, through the constant use of their high voices, make permanent the misdirected action of their phonatory muscles. The larynx remains high up in the throat. The movement of the true and false vocal cords is interfered with. The free vibratory edges of the true vocal cords become reduced to about half the normal length, giving a short string, which always produces a high note. The false cords sag through diminished tension. The size of the ventricles of the larynx becomes reduced, thereby reverting to the original boy or girl size and producing a change in resonance.

A sensitively organized child, especially a boy, is rather surprised and shocked at his initial changes of voice when he is passing through his period of mutation. He tries to continue to speak as he was accustomed to hear himself. This is one manifestation of a series of conflicts

between forces impelling him toward maturation or emotional development and others forcing him to maintain the status quo or to remain fixed at the same level. The latter forces may be his own feelings of doubt and inadequacy regarding his ability to attain the often highly exaggerated state of masculine maturity. This is especially so if he has been subjected to jeering comments regarding his physique or his peculiar vocal efforts during the period of mutation. These fears and doubts, coexisting with other emotional conflicts, and the defenses built up against them during this period of mutation have been aptly called the masculine protest. Often these neurotic conflicts lead to compensations and overcompensations in some other sectors of the personality, as for example, the intellectual. One fact remains, however, that the main structure of the personality is warped or neurotic.

It is in this sense that the three types of abnormality—stuttering, hysterical aphonia and falsetto voice—although symptomatically different, end alike. The sufferers from all these conditions acquire neurotic characters or personalities.

A word about prognosis. The main determinant in the prognosis in all these abnormalities is the degree of healthy personality that the patient presents. The usual order of severity of symptoms, hence also of prognosis, is as follows: stuttering, falsetto voice and hysterical aphonia. The first is the most severe, since the onset of stuttering is almost always in childhood (in the majority of cases the abnormality starts at or before the age of 6 years), so that much less healthy emotional development was attained before the onset of the neurosis. The person with a falsetto voice has the advantage of having had a foundation of healthy emotional development up to the age of puberty before the onset of the disturbance; hence he is in a better position to react in a milder manner, having had the opportunity to establish healthy emotional patterns over a longer period. The hysterical person has the further advantage of a still later date of onset and by the same token a still longer duration of healthy emotional functioning; furthermore, the very nature of the precipitating circumstances is different in that these circumstances are usually situational, in contrast to those in the cases of falsetto voice, in which the precipitating factors are physiologic organic changes.

The treatment of all these conditions falls into two categories. The treatment of dysphemia, or stuttering, owing to the severity and chronicity of the disorder, must be of a highly specialized nature, extended over a long period. Furthermore, as previously pointed out, consideration of the total personality, both physically and psychically, is paramount. This can be brought about only through a special composite therapy. On the other hand, the treatment of hysterical aphonia and falsetto

voice, both of which fall under the heading of dysphonia, requires a relatively shorter and less fundamental therapy. All forms, requiring as they do the application of psychiatric principles, differ in the sense that in the stutterer the main goal of the treatment is development of character—the development of an integrated and more mature personality—while in the cases classed under dysphonia the treatment is more symptomatic and the personality, being less affected, requires a treatment which is less extensive and shorter in duration.

However, persons with falsetto voice and those with aphonia must receive a special form of treatment. These patients usually state, as in the letters quoted, that "the specialist tells me my throat is normal; there is no sign of paralysis, no reason why I cannot speak." But the fact remains that despite various types of physical therapeutic measures, such a patient often does not get better, because his personality and his musical consciousness are almost completely ignored. Physical aid without psychic understanding is not enough.

A realization of this concept should lead one to establish a composite form of treatment that takes cognizance of all factors. Thus, if the patient is fortunate enough to find the special therapeutist, that is, a laryngologist who has both musical and psychiatric leanings—in other words, a musical psychiatric laryngologist—desired results can readily be obtained. Such a physician institutes a composite therapy which correlates the psychic and somatic states into an integrated whole, so that the action on the personality is of such a nature that the patient achieves a normal standard of voice and speech.

In conclusion, let me again point out that for all these conditions therapy must be both of a local and of a general nature but it is of the utmost importance that the therapeutist consider the presenting physical symptom—stuttering, aphonia or paraphonia—as secondary and not as the principal object of treatment. Therapy should be directed toward the person as a whole, the goal being a fundamental change in personality through both a physical and a psychologic approach.

The presentation of several charts and graphs as well as voice and speech recordings of patients before and after treatment demonstrated the Medical-Social Clinic's approach to the problems of dysphemia and dysphonia and its therapeutic procedure.

IRITIS CAUSED BY ASYMPTOMATIC SPHENOIDITIS WITH ANOMALY OF THE SPHENOID SINUSES

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In 1934, while he was in New York, O. H., a man aged 41 at the time of writing, suffered his first attack of iritis. An extensive search for a focus of infection resulted in entirely negative findings. The treatment consisted of local therapy and intramuscular injections of milk, and was followed by gradual improvement and a return to normal but not until the end of three months. Approximately two years later, on April 18, 1936, he presented himself to Dr. Samuel Hirshfeld for examination. The night previous he had suddenly suffered intense pain in the left eye, which immediately became "bloodshot," with sudden marked lacrimation, pronounced photophobia and blurring of vision. He was referred to Dr. Maurice Beigelman, an ophthalmologist, who reported the left pupil to be contracted, with marked pericorneal congestion, cells within the aqueous and reduction in visual acuity to 20/50. The diagnosis was acute iritis.

It was felt that the iritis was secondary to a focus of infection. Smears of material from the prostate gland contained no cells or organisms. Roentgenograms showed that the teeth were entirely normal. Nothing in the general physical examination suggested a possible focus. Examination of the ear, nose and throat gave entirely negative results. The tonsils had been well removed, with no recurrence of lymphoid tissue in the fossae. The lingual tonsils were small, atrophic and entirely innocent in appearance. The ears, pharynx and nasopharynx presented no pathologic changes. The nasal mucosa appeared normal; no pus was present in the nasal passages, and none could be found after thorough shrinkage and suction. The spheno-ethmoid fissures, as visualized with the nasopharyngoscope, presented no injection or edema.

There was observed a high deviation of the septum toward the right side. The antrums and frontal sinuses transilluminated brilliantly. A careful history elicited no symptoms referable to the nasal accessory sinuses. There had been no nasal or postnasal discharge, headache, obstruction to nasal respiration or sneezing, and no recent infection of the upper respiratory tract.

Roentgenograms of the sinuses presented a definite haziness of the right (contralateral) sphenoid sinus, with general loss of outline. Attempts to irrigate this sinus were unsuccessful owing to the high deviation of the septum.

Because of the severity of the iritis and the failure to demonstrate another focus after thorough search, it was determined to explore the right sphenoid sinus surgically. This operation was performed on the night of April 18, 1936, with cocaine anesthesia. The right middle turbinate bone was fractured and displaced away from the midline, after which the front face of the sphenoid became surgically accessible. A Faraci punch was inserted through the region of the ostium, and as much of the anterior wall as possible in all directions was removed with sphenoid punches. A large opening resulted, and the interior of the sinus could be readily visualized. No anatomic variation was noticed. That portion of the

lining membrane which was visible appeared to be intensely reddened and edematous. Cultures resulted in a growth of Bacillus coli in large numbers, with numerous colonies of nonhemolytic streptococci and a few colonies of Bacillus pyocyaneus.

The postoperative course was uneventful. After twenty-four hours marked improvement in the pathologic condition of the eye had taken place. Pain had diminished appreciably, and the redness, photophobia and lacrimation were much less marked. Forty-eight hours after his admission the patient was discharged from the hospital, steady improvement having taken place. All symptoms had almost disappeared, and there was a minimum of injection of the pericorneal vessels, although cells were still present within the aqueous.

On the third postoperative day there developed a sudden recurrence of all symptoms and signs, perhaps more severe than the original attack. The region of the right sphenoid sinus was filled with a large mass of dried blood clot, fibrin,

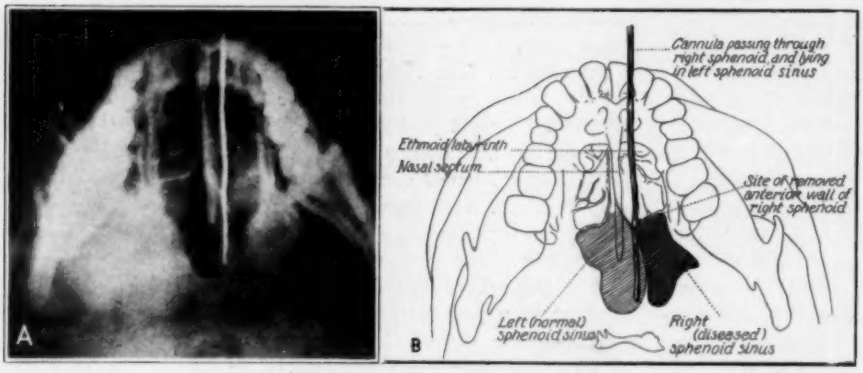
A
B
Cannula passing through right sphenoid and lying in left sphenoid sinus
Ethmoid labyrinth
Nasal septum
Site of removed anterior wall of right sphenoid
Left (normal) sphenoid sinus
Right (diseased) sphenoid sinus

Fig. 1.—*A*, roentgenogram showing the cannula inserted through the right naris but lying within the left sphenoid sinus. *B*, a diagrammatic reproduction of *A*.

lymphatic exudate and purulent crusts. This was removed as completely as possible by suction with a cannula. The surgical opening in the sphenoid was not visible owing to edema of the surrounding tissues. It was possible, however, to enter the sinus with a large cannula, and irrigation with Ringer's solution was carried out. No pus was obtained, and no improvement in the pathologic condition of the eye resulted; on the contrary, the right eye grew progressively worse. Shrinkage and irrigation of the sphenoid sinus were carried out daily for several days. The return flow was always clear, despite which the iritis continued and apparently became more severe.

Ten days after operation it was noted on irrigating the sphenoid sinus that the return flow came through the *left* nostril, which had not been operated on. It was thought that perhaps an anomalous distribution of the sphenoid sinuses might be present. The cannula was therefore allowed to remain in situ, and roentgenograms were taken of the floor of the skull. This revealed that the irrigating cannula, although inserted through the right naris, was actually lying within the confines of the left, or normal, sphenoid sinus.

Figure 1 *A* is a reproduction of this plate. It shows the dividing wall between the two sphenoid sinuses to be considerably to the right of the midline and bowed outward in such a fashion as to protrude farther to the right. Thus,

the posterior part of the right naris is for the most part occupied by the left sphenoid sinus and not by the right.

What had taken place at the operation was easily understood. The presenting anterior wall of the sphenoid sinus had been removed almost in its entirety, but this represented actually a wide opening into the left, or healthy, sinus and only a small opening into the right, or diseased, sinus and this in the extreme lateral portion of the area operated on. This small opening into the right sinus was therefore immediately behind the prominence of the middle turbinate and the ethmoid capsule. Such a small opening sufficed for adequate drainage for a time, with temporary amelioration of symptoms, but drainage from it soon became inadequate owing to obstruction from the mass of postoperative débris and from edema. When the débris had been cleaned away postoperatively, its removal had not been sufficiently thorough to free the small anatomically inaccessible opening into the right sphenoid sinus, and together with the edema this

Fig. 2.—The cannula when bent at the tip comes to lie within the right sphenoid sinus.

resulted in retention of pus and recurrence of the pathologic condition of the eye. Apparently, too, portions of the dividing wall between the two sinuses had been bitten away without such removal having been recognized.

The peculiarities of the anatomic distribution having been established and a reasonable conclusion having been reached to explain the disappearance and recurrence of the iritis, further steps in the treatment suggested themselves. From examination of the roentgenograms of the base of the skull it seemed that while a straight cannula could not easily be inserted into the right sphenoid sinus, a cannula curved to the right would slip by the dividing wall into the diseased right sinus. A cannula was accordingly bent, inserted into the sinus and retained in situ, and further roentgenograms were taken. This demonstrated that the cannula had actually entered the right sphenoid sinus, as demonstrated in figure 2.

Irrigation was then carried out through this curved cannula, and a large amount of thick, tenacious yellow pus was obtained. Improvement in the iritis, which had by this time become severe, occurred almost immediately. The day following the irrigation injection of the vessels had diminished appreciably and decided amelioration of the subjective symptoms had taken place. The cells in the aqueous became

fewer. Repeated irrigation of the right sphenoid sinus with the curved cannula produced smaller and smaller amounts of pus, and within a few days all symptoms had abated. A constantly diminishing number of cells persisted in the aqueous for perhaps a week or ten days, but then they disappeared. Vision had returned to 20/20, and the patient was discharged as cured.

This case presents many important phenomena. First, there existed sphenoiditis, which was completely asymptomatic. There was no history of nasal or postnasal discharge and no headache. A thorough examination of the nose gave entirely negative results, and yet the sphenoid sinus contained a markedly reddened, distinctly pathologic mucosa. Second, cultures of material from the sphenoid sinus yielded B. coli in great profusion, which in itself must be rare. Third, there had apparently been hematogenous spread of infection, causing iritis in the opposite eye. The sequence of events, i. e., the improvement in the iritis following the initial opening of the sinus, the recurrence of symptoms when that opening became blocked and the prompt cure following the reestablishment of drainage from the sphenoid, is a chain of circumstances pointing definitely to a close association between the iritis and the sphenoiditis. Fourth, an anatomic anomaly was directly responsible for inadequate surgical treatment; however, when it was once recognized, adequate treatment resulted in a cure.

While anomalous distribution of the sphenoid sinuses is not rare as observed roentgenologically and in the cadaver, it had not been my experience to observe a case in which the anomaly played so important and dramatic a rôle in the course of pathologic and therapeutic events.

ACUTE STREPTOCOCCIC EDEMA OF THE LARYNX WITH SECONDARY ATELECTATIC PNEUMONITIS

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The purpose of this paper is to emphasize the seriousness of streptococcic edema of the larynx and the necessity for early recognition and treatment.

The condition has been known under various names, such as spasmodic croup, black croup, strangulation croup and laryngeal stridor, and in later days as acute bronchial stenosis, acute bronchitis and laryngitis, laryngotracheitis, nondiphtheritic croup and many other synonyms.

Seven years ago a member of the staff of the Montgomery Hospital asked me to visit a patient with him.

The boy, 8 years old, was unable to breathe properly, and while he was apparently not very ill, he had a shocked and worried appearance. Owing to his difficulty in respiration I suggested that he be removed to the hospital for care and for immediate surgical intervention if necessary. I accordingly took him to the hospital and placed him in a tent for steam inhalation. Early the following morning he suddenly became cyanosed. Despite a hasty tracheotomy, he died on the operating table. An autopsy was performed. No definite reason was to be seen macroscopically for the death. The report ascribed death to streptococcic laryngitis.

The recent case which caused me to write this paper was observed by me as consultant on Nov. 27, 1936, at 7:30 p. m. The baby was 9 months old and had been sick for several days. The condition started, according to the physician, as an ordinary cold. Forty-eight hours before I saw the baby, it had shown evidence of dyspnea and obstructed breathing. The physician, thinking this was diphtheritic laryngitis, gave the child two doses of 10,000 units of diphtheria antitoxin six hours apart. The condition grew progressively worse. The physician tried intubation with no success, being unable to insert the tube. I went with him to see the baby. It lay on the bed vainly trying to complete inspiratory efforts. There was no odor, no strident cough and no metallic grunt: just a violent inspiratory effort, with extreme stretching of the muscles of the chest and abdomen on inspiration. I opened the mouth and inserted a laryngoscope. The examination revealed the typical red, angry-looking pharynx, swollen epiglottis and arytenoid-cricoid folds and edema of the adjacent areas; I was unable to see the cords. The diagnosis was acute streptococcic edema of the larynx. The child was brought to the hospital. The roentgen examination revealed complete obstruction of the upper right bronchial tree, with involvement of the

Read at the Montgomery Hospital, Dec. 21, 1936.

upper lobe of the right lung to the point of apparent consolidation, or atelectasis. The baby was put in an oxygen tent, and while attempts were being made to have an experienced bronchoscopist come to the hospital, extreme rigor suddenly developed and despite a tracheotomy death occurred suddenly. An autopsy was performed. The observations were extremely interesting, typical and logical. The larynx, trachea and upper portion of the bronchi were swollen, edematous and full of thick fibrinous exudate, and, most significant, "the entire tracheal tree and its rings were obliterated in the macroscopic appearance." The right bronchus was collapsed and swollen. The upper lobe of the right lung was black and absolutely atelectatic. It had been shut off from its air supply. There was no foreign body. A large amount of thick yellow pus had been previously removed during the tracheotomy. A specimen was taken for culture. It proved later to contain a pure growth of streptococci.

The baby no doubt died of acute streptococcic edema of the larynx, trachea and bronchi, with secondary atelectasis of the upper lobe of the right lung. Stenosis and consequent asphyxia were the actual cause of death. The respiration was shut off, and an area of acute fulminating atelectasis developed in the chest, with failure of the respiratory center, asphyxia and consequent death.

The practical points to be considered are diagnosis, inferential and visual, and treatment.

DIFFERENTIAL DIAGNOSIS

In reference to diagnosis, one must by inference or inspection rule the condition to be a foreign body, diphtheritic laryngitis, laryngeal stridor or acute fulminating laryngitis, with contiguous pathologic changes and continuity involvement. I should rule out diphtheria for the following reasons:

1. Age—diphtheria is rare in persons under 1 year of age.
2. Lack of odor or appearance of membranes in the fauces (absence of faucial membranes is rare).
3. Lack of peculiar metallic cough.
4. No improvement after injection of antitoxin (therapeutic reason).
5. The high temperature—103 to 104 F. This will hardly be present in diphtheria or laryngeal stridor.
6. Inspiratory effort (typical in cases in which passages are closed off).
7. Signs of intense shock.

This brings one to laryngeal stridor. This disease, or rather condition, is found in feeble undernourished children, who are flabby and weak and present symptoms which cause one to suspect enlargement of the thymus gland. As a rule, it is common in children under 1 year. Luc, the great French laryngologist, said it is more common in boys. It is regarded as an adductor spasm, and in origin it is probably a stimulation of the recurrent nerve. It is not attended by fever, has a sudden onset with paroxysm, and an expiratory grunt and by

virtue of its repeated attacks can be distinguished from laryngitis caused by a definite bacterial factor. The attack usually occurs at night, has a great many alarming signs and symptoms and in some cases, if prolonged, may cause suffocation in infants weak and debilitated from pulmonary collapse (Eustace Smith). This is a condition involving the tone of the laryngeal muscles. Increase of tone of the adductor muscles will undoubtedly cause this annoying condition. Inspection, either direct or indirect, with a laryngoscope or a mirror will show a pink normal-looking glottis, not swollen, but simply in the throes of an adductor spasm. Mechanical intervention either with a tube or with a bronchoscope will restore the inspiratory capacity and rhythm of the child's breathing. Simply pulling out the tongue may do it.

The adductor muscles bring the cords together by the action of the lateral thyro-arytenoid and cricothyroid muscles, which are supplied by the recurrent laryngeal nerve. The abductor muscles separate the cords by the action of the posterior crico-arytenoid muscles. These muscles are also supplied by the recurrent laryngeal nerve, which is a part of the vagus or the respiratory nerve of Bell.

In regard to the innervation of the smooth muscle of the bronchi, not much is known about the rôle of the involuntary nervous mechanism. It has been seen through the bronchoscope that stimulation of the vagus nerve constricts the bronchi. Except in the newer knowledge that a substance known as acetylcholine is produced by stimulation of the vagus, not much is known. Braeucker, a German, dissected out the autonomic nerves to the pulmonary area and found that all the parasympathetic nerves before and beyond their ganglions are vagal in their connection and synapse with the posterior and anterior pulmonary plexuses around all the bronchi. The sympathetic nerves do the same thing with the cardiac plexus coming from the stellate ganglions.

The treatment for laryngismus stridulus is mechanical dilation. Obstruction due to foreign body at the carina or at one of the main bronchi may produce similar symptoms and will also produce all the clinical symptoms of diphtheritic laryngitis, such as increased inspiratory effort and the drawing in of the epigastrium and the suprasternal notch.

The difference between diphtheria and streptococcic infections usually is apparent, for in streptococcic infections the child will be shocked, bluish or cyanotic—particularly the extremities—and the temperature will be high. The real diagnosis is or can be made by inspection with a laryngoscope or, if one is capable, with a bronchoscope. The glottis is closed, the arytenoid cartilages are edematous and the whole area is suffused with the deep, fiery, angry red of acute infection. Here one will recognize whether it is a streptococcic, an influenzal or a mixed infection. A smear will soon tell you. Jackson stated that the mortaility for streptococcic infection is 70 per cent. St Clair Thompson placed it at 80 per cent; others, even higher. The mortality for the other types is small.

TREATMENT

The treatment of diphtheria is administration of diphtheria antitoxin. In case of streptococcic infection, I believe that one should immediately isolate the patient and put him in a steam tent with the atmosphere saturated with a medicated vapor. Gas therapy should be provided, and one should promote diaphoresis and diuresis with fluids to the saturation point. One of the best treatments is blood transfusion. The patient should be kept quiet and at rest and in a moist, heavy atmosphere. Streptococcus serum is of value in some cases, and no doubt it should be used. It does not compare in its efficacy with diphtheria antitoxin in diphtheria. Tracheotomy with suction is the most important life-saving procedure; the technical details should be left to one who knows how to proceed with it. Certain medicines are useless. Jackson condemned opium and its derivatives and atropine, as they help to dry up secretion and defeat the main purpose, which is to get air into the lungs and encourage respiration.

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USE OF THE BENZEDRINE INHALER FOR CHILDREN

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In the present study an attempt was made to determine (1) the feasibility of administering benzedrine to children by dry inhalation, (2) the therapeutic effect of such inhalation and (3) the possible occurrence of toxic effects.

Children under treatment in the outpatient department of the Children's Hospital of Philadelphia were selected. Seventy-five were suffering from acute rhinopharyngitis and sinusitis and twenty-five from acute otitis media with rhinopharyngitis. Two children with asthma and two with epistaxis also were treated. The ages varied from 1 to 12 years.

For the older children, the method advised for the use of the inhaler was similar to that described for adults. These children were able to use the inhaler satisfactorily and with apparent good results. For the younger children and for infants the parents were instructed to insert the inhaler into each nostril and allow one deep inspiration (during crying) hourly. In those instances in which the mother would cooperate this technic was satisfactory. Before the inhaler was given for home use, the technic was demonstrated to the mother in the clinic. Care was taken to choose families who would cooperate in every respect.

In each case observations were made in the clinic before and fifteen minutes after the use of the inhaler to determine its immediate effect. In a typical case prior to the use of the inhaler there were edema and congestion of the nasal mucous membrane with mucopus in both meatuses and in the nasopharynx. In most instances the child had obstructed breathing. The inhaler was then employed three times at five minute intervals, and the nose and throat were again examined. It was found that after the use of benzedrine there were marked shrinkage and blanching of the nasal mucosa and increased drainage from the meatuses, often producing an increase in the postnasal discharge. (The children between 3 and 12 years of age "hawked up" and expectorated the mucus from the pharynx.) This increased drainage was associated with freer passage of air through the nose and relief from the "stuffiness."

This study was aided by a grant from Smith, Kline and French.

In no case was any ill effect noted by the examiner or reported by the parents from the use of the benzedrine inhaler. Headache was not complained of, and sleeplessness and restlessness were not encountered. No gastro-intestinal disturbance, as is sometimes noted after the use of ephedrine compounds, was observed.

In all the seventy-five cases of acute rhinopharyngitis and sinusitis, more or less relief from the obstructive symptoms was apparent. In each instance the mother seemed highly pleased with the results.

In the twenty-five cases of acute otitis media the inhaler did not seem to alter definitely the course of the disease, but it did help in relieving the nasal symptoms.

In the two cases of asthma the nasal obstructive symptoms were relieved. In the two cases of epistaxis due to bleeding in Kisselbach's triangle in which the inhaler was used in an attempt to produce vasoconstriction, it failed to influence the bleeding.

SUMMARY

It was found that the benzedrine inhaler can be satisfactorily employed for young children for the relief of obstructive symptoms in the nasopharynx due either to infection or to allergic edema. No untoward symptoms were noted from the use of the inhaler.

ACUTE LABYRINTHITIS WITH COMPLICATING LATE FACIAL PARALYSIS

REPORT OF A CASE

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The following case seems worthy of a report because of late facial paralysis after an operation on the labyrinth due to the formation of a sequestrum.

REPORT OF CASE

History.—A 6 year old girl became ill, with vertigo and earache on the right side, on the afternoon of May 28, 1935. She had apparently been well during the forenoon, except for a slight cold. This was not her first attack of otitis. In fact, she had been subject to repeated attacks for two years preceding a tonsillectomy in the summer of 1934. She had had no attack since the tonsillectomy until the present one.

The pain and vertigo continued through the night, making sleep impossible. The same symptoms, with vomiting added, continued all day on May 29. She was first examined by me at 6 p. m. of that day. The chief findings were moderate fever, marked tenderness over the mastoid, marked rotatory nystagmus toward the left, much pus in the external canal, a red and swollen ear drum and signs of acute infection of the respiratory tract in the nose and throat.

Hearing was present in the right ear but was much reduced.

A diagnosis of acute mastoiditis with complicating serous labyrinthitis was made.

Since the duration of the entire attack had been only one day, it was decided to encourage drainage from the ear and to await developments until the following morning.

The mother, calling by telephone at 6:30 a. m. on May 30, reported that the symptoms had not subsided; so it was arranged that the child be brought to the hospital for immediate operation.

Another examination was made an hour later. It was found then that the labyrinth was dead to all tests (tuning forks, voice and caloric) and that there was slight but definite stiffness of the neck. The temperature was 102 F. The mastoid and aural findings were unchanged. A spinal puncture was done, and the fluid pressure found to be 6 mm. The fluid was cloudy; the Nonne-Apelt reaction was positive, and the cell count was 800.

It was apparent that the labyrinthitis had reached the suppurative stage, that meningitis was already beginning and that the patient's welfare demanded immediate operation on the labyrinth.

Operation.—The labyrinth was drained according to the technic of Neumann. The lateral sinus was encountered with the first cut of the chisel into the cortex close behind the external canal. It was not until this happened that it was noticed that the sinus lay so close to the surface that its course could be followed on the outside of the skull as a faint blue band. The anterior position of the sinus made the subsequent dissection on the labyrinth difficult. The mastoid was found to

be actutely inflamed throughout, with little softening of the bone and little pus. A little pus was found around the sigmoid sinus. The middle fossa was opened, and the dura was found to be normal.

After the labyrinth had been drained, the dura of the posterior fossa was laid bare medial to the sinus and opened by means of a crucial incision. Much fluid escaped. A bothersome little bleeding vessel was encountered in the dural incision that probably accounted for the blood subsequently found in the spinal fluid.

Fig. 1.—Facial paralysis which developed twenty-seven days after an operation for suppurative labyrinthitis with complicating meningitis.

A second operation revealed the fact that a portion of the labyrinthine capsule, including a part of the facial canal, had sequestrated. The resulting formation of pus had blocked the nerve.

Fig. 2.—The sequestrum found at the second operation mounted on an ordinary pin, as compared in size with the incus from the same ear.

The upper groove in the sequestrum is a portion of the wall of the horizontal semicircular canal, while the lower groove is a portion of the facial canal.

Movements of the face began four days after the removal of this sequestrum.

The operation was concluded, leaving the radical mastoidectomy incomplete as far as the plastic operation on the canal was concerned. It was deemed wiser to wait for that until some later date.

Postoperative Course.—For two or three days there was a tremendous leakage of spinal fluid through the dressings.

Spinal puncture was done on each of the first three postoperative days. The fluid was faintly red and slightly cloudy each day, and the cell counts were, respectively, 900, 950 and 1,890. Differential counts revealed the interesting fact that most of the cells were red blood cells and that the leukocyte count was actually dropping rapidly. In the three specimens the leukocyte count was 250, 95 and 19, respectively.

Convalescence was rapid and otherwise uneventful until the twenty-seventh day, when it was noticed that there was weakness of the right side of the face. By that time the patient had been home from the hospital and running about for some time. This weakness became more pronounced until the thirtieth postoperative day, when paralysis was complete.

It was decided to explore the facial nerve for the cause of the nerve block.

Operation on the Facial Nerve.—On June 29 the mastoidectomy wound was reopened and cleaned out. The facial canal was exposed from below upward but had not yet been opened when a loose bit of sequestrated bone was encountered. It lay where the labyrinthine capsule had been tunneled under the facial canal to drain the vestibule (between the horizontal and the posterior semicircular canal). There was an accumulation of pus in this tunnel. The sequestrum included what remained of the horizontal semicircular canal and half of the contiguous portion of the facial canal. When it had been removed, the facial nerve lay exposed on its superior aspect.

The occasion was taken to complete the radical mastoidectomy by doing a plastic operation on the canal.

Postoperative Course.—Convalescence was rapid and uneventful. The cavity healed rapidly and completely and remained dry.

Facial movements began on the fourth postoperative day, and by the ninth day they seemed to be entirely normal.

Cultures of pus obtained at the first operation contained streptococci.

Pus from the second operation yielded no bacterial growth.

Progress in Otolaryngology

Summaries of the Bibliographic Material Available in the Field of Otolaryngology

TUMORS OF THE NOSE AND THROAT

GORDON B. NEW, M.D.
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AND
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GENERAL CONSIDERATIONS

Torrigiani and Palumbo [1] reported the results of treatment by irradiation of malignant tumors of the upper respiratory passages. After years of experience they continue to prefer treatment by radium to that with roentgen rays. They make use of surgical operation to facilitate the application of radium. Thirty-six tumors involving the nose and paranasal sinuses, 30 involving the nasopharynx, 88 involving the pharynx and tonsils, 32 involving the hypopharynx and 30 involving the larynx were listed, with the type of treatment and results. They stated that the cases considered by many as the most favorable for surgical intervention are also the most favorable for radium therapy. They prefer to irradiate the metastatic lesions rather than expose the patient to extensive block dissections.

Eigler and Koch [2] reported 8 cases of reticulo-endothelial sarcoma: 5 tumors of the tonsil, 1 of the nasopharynx and 2 arising in the cervical lymph nodes. They discussed the differential diagnosis from lympho-epithelioma. Clinically, the distinction is very difficult to make; histologically, accurate technic and study are necessary to make the diagnosis. They found a great difference in the amount of differentiation and malignancy of the lesions in their cases, but irradiation therapy continued to be the treatment of choice.

From the Section on Laryngology, Oral and Plastic Surgery, the Mayo Clinic.

1. Torrigiani, C., and Palumbo, V.: Radiumterapia dei tumori maligni delle prime vie respiratorie, Ztschr. f. Hals-, Nasen- u. Ohrenh. **40**:44-133, 1936.

2. Eigler, Gerhard, and Koch, Johannes: Die Retothelsarkome (Morphologie, Klinik und Strahlensensibilität), Arch. f. Ohren-, Nasen- u. Kehlkopfh. **140**: 278-308 (Jan.) 1936.

NOSE AND SINUSES

Kramer and Som [3] reported in detail 5 cases of true papilloma of the nasal cavity observed in their practice. They collected 81 cases reported in the literature in which they classified the lesion as belonging to this rather rare disease entity. They expressed the belief that three other pathologic types of nasal neoplasm frequently have been mistaken for true papilloma. These are: (1) mucous polyp of the common inflammatory type, (2) cutaneous wart, which arises in the vestibule of the nose, especially in the septum, and (3) papillary carcinoma. None of these should be confused with true papilloma, or papilloma dura, which is a purely epithelial growth, usually arising from the accessory sinuses or the deeper parts of the nasal cavity, and characterized by grayish red, lobulated, villous, easily bleeding masses spread over a large surface. These have a great tendency to recur and not infrequently undergo malignant transformation. Kramer and Som have found surgical diathermy of great advantage in the removal of these growths because of the easier control of hemorrhage. They expressed the belief that the tendency to recurrence is attributable to incomplete removal but also may be a result of the tendency of the mucosa to form these growths. A positive diagnosis can be made only by removal of a specimen for biopsy. They expressed the belief that the treatment of choice is thorough surgical removal followed by radium therapy.

Robinson [4] briefly reported his results in the treatment of malignant tumor of the nasal sinuses. He found that roentgenologic examination is of little help in the diagnosis and that the condition was diagnosed late in many cases because exploratory maneuvers were not performed. He advocated radiation therapy for all active types of growth. He found, however, that surgical drainage is often indicated when infection is present and to render the growths more accessible. In a series of 60 cases, in most of which the process was far advanced, there were 12 patients (20 per cent) who were well for five years and 15 (25 per cent) who were well for three years.

Geschickter [5] examined and classified microscopically 211 tumors removed from the nose, nasopharynx and paranasal sinuses at the Johns Hopkins Hospital. This series included almost every known type of benign or malignant growth to be found in this region. He described the pathologic picture of each type briefly but clearly. The article is well worth reading. There were 19 benign epithelial tumors,

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3. Kramer, Rudolph, and Som, M. L.: True Papilloma of the Nasal Cavity, Arch. Otolaryng. **22**:22-43 (July) 1935.

4. Robinson, G. A.: Diagnosis and Treatment of Malignant Tumors of the Nasal Sinuses, Am. J. Roentgenol. **34**:641-643 (Nov.) 1935.

5. Geschickter, C. F.: Tumors of the Nasal and Paranasal Cavities, Am. J. Cancer **24**:637-660 (July) 1935.

among which were included salivary mixed tumors usually regarded by pathologists as malignant, 139 malignant epithelial tumors, 37 benign connective tissue tumors and 16 malignant connective tissue tumors. An extensive bibliography is appended.

NASOPHARYNX

Schinz and Zuppinger [6] reported briefly 26 cases of malignant tumor of the nasopharynx in which treatment was given between 1930 and 1936 by protracted fractional roentgen therapy. Sixteen of the tumors were carcinomas, for the most part lympho-epitheliomas; the remainder were sarcomas. The average age of the patients was 43½ years; the youngest was 15. Only 5 were women. None survived into the fifth year after treatment was begun.

Koch and Eigler [7] reported 6 cases of nasopharyngeal fibroma, in 2 of which the lesion involved the paranasal sinuses, in which treatment by a combination of radium and roentgen rays was successful. There were no untoward effects on the normal tissues. The time required for complete cure was about one and one-half years. They expressed the belief that this is the treatment of choice.

Baumann-Schenker [8] reviewed 29 cases of lympho-epithelioma of the upper air passages. In 23 the epithelioma was primary in the nasopharynx, and in 3 in the tonsil; in 2 cases it was in the hypopharynx and in 1 it was found in the trachea, the place of origin being doubtful. These cases were observed and treatment was applied between 1928 and 1935. The treatment consisted in roentgen therapy by the protracted fractional method. After the completion of the treatment careful examination frequently revealed the persistence of a "rest-tumor," which was difficult to eradicate. This remnant of tumor frequently could not be demonstrated by nasopharyngoscopy, but its presence was revealed on removal of a specimen for biopsy or on the use of iodized poppy-seed oil and roentgen examination by Zuppinger and Ruedi's method.

Martin [9] discussed the treatment of carcinoma of the pharynx and nasopharynx by irradiation. He has adopted a modification of the Coutard roentgen ray technic, which has shortened the periods of treat-

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6. Schinz, H. R., and Zuppinger, Adolf: Zürcher Erfahrungen der Radiotherapie bei bösartigen Epipharynxtumoren, Ztschr. f. Hals-, Nasen- u. Ohrenh. **41**:173-177, 1936.

7. Koch, Johannes, and Eigler, Gerhard: Beiträge zur Strahlenbehandlung der Basalfibroide, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **142**:1-14 (Oct.) 1936.

8. Baumann-Schenker, Rudolf: Ueber das lymphoepitheliale Karzinom. Zürcher Erfahrungen aus den Jahren 1928-1935, Strahlentherapie **55**:369-386, 1936.

9. Martin, C. L.: Carcinoma of the Upper Pharynx, Am. J. Surg. **30**:36-54 (Oct.) 1935.

ment, making it possible to treat a larger number of patients. In some cases he combined roentgen therapy with the interstitial implantation of radium by Quick's method. Reports of cases were given.

PHARYNX

Woodward [10] reported a case of cavernous hemangioma involving the palate, pharynx, larynx and esophagus. Dark red, irregular, nonpulsating masses which were compressible were seen in these structures. Diagnosis was confirmed by removal by surgical diathermy of a specimen from the uvula for biopsy. The chief complaint was of recurrent and increasingly severe hemorrhage. Radium packs were applied; the masses diminished in size, and the hemorrhages ceased. Woodward reviewed the scanty literature on this rare condition and concluded that whereas these tumors are essentially benign they are dangerous to life when situated in the larynx and pharynx because of their proneness to hemorrhage. Surgical removal may be performed but is dangerous. Radium packs are considered the treatment of choice.

Edling [11] reported the early results of treatment by means of the teleradium gun in 8 cases of cancer of the larynx and 10 cases of cancer of the hypopharynx. He noted that the reaction to this type of treatment is less marked than that to the protracted fractional method of roentgen therapy. Five patients who had cancer of the larynx had been well from ten months to three and one-fourth years after treatment at the time of writing; of the second group 4 patients had been well for periods varying from one and three-fourths to three and three-fourths years. A description of the technic employed was given.

Salinger and Pearlman [12] reviewed a series of 24 cases of malignant tumor of the epipharynx. With the purpose of simplifying the existing confusion as to the classification of tumors of this region, they submitted specimens removed for biopsy from these patients to three different pathologists, who almost unanimously made a diagnosis of transitional cell epithelioma in 75 per cent of the cases; in 8 per cent the diagnosis was sarcoma. The remainder received varying diagnoses. Lympho-epithelioma was diagnosed 6 times, two of the pathologists agreeing on this diagnosis in only 1 instance. Endothelioma, formerly diagnosed frequently, was named once by one pathologist. Salinger and

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10. Woodward, J. F., Jr.: Cavernous Hemangioma of the Hard and Soft Palate, Anterior and Posterior Pillars of the Pharynx and the Larynx, Laryngoscope **46**:32-41 (Jan.) 1936.

11. Edling, Lars: Primary Results of Teleradium Treatment in Cancer of Larynx and Hypopharynx at the Radiologic Clinic of the University of Lund. 1931-1933, Radiology **25**:267-273 (Sept.) 1935.

12. Salinger, Samuel, and Pearlman, S. J.: Malignant Tumors of the Epipharynx, Arch. Otolaryng. **23**:149-172 (Feb.) 1936.

Pearlman reviewed previous statistics and noted the great discrepancy in the pathologic conditions reported. The greatest similarity to their own observations was noted in the reports of one of us (G. B. N.) (Broders' classification) and Ewing. The pathologist consulted by Salinger and Pearlman had great difficulty in differentiating transitional cell epithelioma and lympho-epithelioma. A summary of their case histories was given, from which cervical adenopathy, otalgia, other symptoms referable to the ear and pain due to involvement of the fifth cranial nerve appeared to be the most frequent symptoms. The symptomatology and treatment were discussed briefly, and the results of 6 postmortem examinations were given. Some clear photomicrographs accompanied the article.

One of us (G. B. N.)[13] reported 2 additional cases of xanthoma (2 had been reported by him in 1932) involving the upper air passages. In the first case there were many small xanthomatous patches in the pharynx and on the palate, vallecula and epiglottis as well as one nodule in the subglottic region. There was scarring of the arytenoid cartilages and epiglottic region which had caused a ringlike thickening. The patient complained of some difficulty in swallowing. This patient also had pernicious anemia. The second patient's only symptom was increasing hoarseness. On examination a yellowish tumor involving the posterior two thirds of the left true and false vocal cords was found. Thyrotomy was performed, and the tumor was removed with the aid of surgical diathermy. No recurrence was noted a year later. Examination of the tissue in both cases revealed the typical appearance of xanthoma. The obscure etiology of this condition, suspected to be connected with a metabolic disturbance, and its pathologic picture, course and treatment were discussed. No treatment has been found to give definite results.

Berven[14] reviewed the results of treatment of malignant tumors of the mouth and pharynx at Radiumhemmet, Stockholm, Sweden, with his usual thoroughness. The treatment consisted almost exclusively of teleirradiation with Sievert's apparatus, brachyirradiation (interstitial placing of needles and surface applications), electrocoagulation and surgical removal of operable metastatic lesions. The technic was described in detail for certain cases, stress being placed on the necessity of sparing the supporting stroma if good results are to be expected. Thirty-nine persons with carcinoma and lympho-epithelioma of the tonsil were treated between 1923 and 1930; 16 (41 per cent) of the patients had remained free from symptoms for five years or more at the time of writing.

13. New, G. B.: Xanthoma of the Pharynx and Larynx, Arch. Otolaryng. **22**:449-453 (Oct.) 1935.

14. Berven, E. G. E.: Die radiologische Behandlung von malignen Tumoren in Mundhöhle und Mesopharynx, Ztschr. f. Hals-, Nasen- u. Ohrenh. **40**:1-14, 1936.

On reviewing the results obtained in the treatment of 89 patients with carcinoma of the hypopharynx between 1921 and 1926 (8, or 9 per cent, of the patients still survive), Coutard [15] stated that in this region the best results are to be expected with noninfiltrating tumors, for instance, most tumors of the vallecula and the glossopharyngeal sulcus. He found that increase of the dosage of roentgen rays does not improve the results and may prove disastrous because of the destruction of the supporting stroma. Better results are to be obtained by lengthening the time of administration. He stated that the infiltrating types of growth alter the supporting tissues, rendering them more susceptible to damage by the radiation. When one is dealing with this type of growth, protection of the surrounding stroma is more important than actual destruction of the growth.

Maisin and Vassiliadis [16] reported in detail the results of treatment at the Louvain Cancer Institute of 154 patients with cancer of the pharynx or oral cavity in nine years. In 53 cases the lesion involved the larynx, in 51 the tonsils and tonsillar pillars and in the remainder the floor of the mouth and the tongue. Treatment consisted of roentgen therapy by a modification of Coutard's method, teleirradiation and moulage. The last-mentioned method of treatment was abandoned in later years. A combination of irradiation and surgical therapy was employed when there were metastatic lesions which could be removed. Maisin and Vassiliadis' results compare favorable with those of other large clinics, more than 11 per cent of their patients having survived more than seven years. The most interesting feature of their treatment is the administration of small doses of barium by mouth as a catalytic agent. This treatment, which was tested in mice first, when adopted and used for human beings caused an improvement of from 15 to 40 per cent in the results obtained over those obtained in a series of cases in which this treatment was not employed.

Kisfaludy [17] described the treatment of malignant tumor of the tonsil. Surgical diathermy was used in some cases but only superficially. The main treatment consisted in interstitial irradiation by means of especially long needles containing from 2 to 6.6 mg. of radium. This treatment was combined with surgical removal of the regional lymph nodes, roentgen therapy and moulage. Forty inoperable and 32 operable tumors were treated. There was no operative mortality. Kisfaludy

15. Coutard, H.: Ueber Röntgentherapie der Pharynxkarzinome, Strahlentherapie **52**:1-10, 1935.

16. Maisin, J., and Vassiliadis, H.: Ueber die Behandlung der Mundhöhlen-und Hypopharynxkrebse, Strahlentherapie **54**:193-215, 1935.

17. Kisfaludy, P.: Ueber die kombinierte Behandlung des Tonsillenkrebses, Strahlentherapie **55**:429-442, 1936.

found that local recurrence is rarely the cause of ultimate death. The most frequent causes of death among his patients were cachexia and distant metastasis.

Cade and Allchin [18] reported 52 cases in which carcinoma of the pharynx and hypopharynx were treated by a combination of roentgen rays and the radium bomb. They expressed the belief that this combination permits more effective treatment with less serious damage to the tissues. They maintained that tumors which are no longer affected by a given wavelength may be sensitive to other wavelengths. They divided the growths into four groups according to situation as follows: those of the epipharynx (by which they mean the aryepiglottic folds, arytenoid cartilages and epiglottis and not the nasopharynx), those of the posterior and lateral pharyngeal walls, those of the pyriform fossa and those of the postcricoid region. The technic of treatment varied according to situation and the type of tumor, which they judged more by its appearance than by the histologic report. Of the 52 patients treated, 17 had remained well for periods up to three and one-half years at the time of writing. The technic of treatment was described: a radium bomb containing 2 Gm. of radium was used, but Cade and Allchin expressed the belief that doubling this quantity will produce better results.

LARYNX

A method for the conservative surgical treatment of carcinoma involving the anterior portion of the larynx on both sides was described by Patterson.[19] A skin flap shaped like a question mark is made, with the convexity turned toward the side on which the growth is most extensive, with the view of avoiding fistulous openings. The cartilage is bitten away with a forceps. Before the cavity is entered, a tracheotomy is performed and the endomucosa is opened well wide of the visible lesion. Liberal use of the endothermic knife is advised. The author advocated this operation as being more flexible than the usual hemilaryngectomy and stated that although the indications for it are of necessity extremely limited it may be performed in a few cases in which thyrotomy would not be radical enough and laryngectomy too radical. He has performed this operation in 7 cases, with five year cures in 42 per cent. Two of the patients who did not survive five years did not die of a recurrence.

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18. Cade, Stanford, and Allchin, F. M.: Combined Distance Radiation of Hypopharyngeal Cancer, Lancet **2**:652-656 (Sept. 21) 1935.

19. Patterson, Norman: Carcinoma of the Larynx: A Plea for More Conservative Surgical Procedures in Certain Cases, Arch. Otolaryng. **23**:295-305 (March) 1936.

New and Figi [20] discussed the various types and situations of malignant tumor, both intrinsic and extrinsic, involving the larynx and their treatment. A short description was given of the various procedures in use at the Mayo Clinic in the treatment of these conditions. A more exhaustive description was given of their technic of laryngectomy. In a recent review of 135 consecutive operations for carcinoma of the larynx—75 thyrotomies and 60 laryngectomies—it was found that only 1 death had occurred in the series. On reviewing 107 cases in which operation was performed prior to 1929, they found that five year cures were obtained in 82.3 per cent of the cases in which thyrotomy had been performed and in 56.1 per cent of the cases in which laryngectomy had been performed.

Two hundred and two consecutive cases of carcinoma of the larynx observed at the Collis P. Huntington Memorial Hospital in Boston in the period between 1919 and 1933 were reviewed by Garfin.[21] A good history of this branch of laryngology was given, with a critical review of the treatment by surgical procedure and irradiation. Seven patients underwent total laryngectomy, and 3 survived for periods varying from three to four years. Laryngotomy or laryngofissure was performed in 12 cases, with 1 operative death. Of the remaining 11 patients, 4 survived from five to fifteen years. In 20 cases treatment consisted of a combination of surgical operation and irradiation; 5 patients survived more than three years. Thirty-three patients were treated with radium. In many of these cases the carcinoma was extrinsic at the time of examination. The average survival of the patients was only six months. There was 1 death three days after the insertion of radon seeds. Thirty-seven patients with advanced carcinoma were treated with roentgen therapy alone. Only 4 survived a year or more. Forty were treated by combined radium and roentgen rays. Twelve patients in this group survived more than one year, and 1 more than five years. There was 1 death shortly after treatment. Nineteen patients received no treatment. It appears from Garfin's article that early operation still offers the best chance for a permanent cure. The necessity for early diagnosis was stressed.

Hautant [22] discussed the relative merits of irradiation and surgical operation in the treatment of intrinsic cancer of the larynx; he based his remarks on his personal experience in 200 cases in which operation was performed and 122 cases in which the treatment was under the

20. New, G. B., and Figi, F. A.: Treatment of Carcinoma of the Larynx, Surg., Gynec. & Obst. **62**:420-423 (Feb. 15) 1936.

21. Garfin, S. W.: Cancer of the Larynx: A Study of Two Hundred and Two Cases with End Results, New England J. Med. **213**:1109-1123 (Dec. 5) 1935.

22. Hautant, A.: La radiothérapie des cancers intra-laryngés. Ses indications et celles de la chirurgie, Ztschr. f. Hals-, Nasen- u. Ohrenh. **40**:15-29, 1936.

supervision of Coutard at the Curie Institute, in Paris, France. He concluded that the choice of method must depend on an accurate study of each case. The type, extent and situation of the growth are equally important in making this choice. He divided cancers of the larynx into three types—that tending to grow toward the surface, which is amenable both to surgical treatment and to radiotherapy; that tending to infiltrate deeply, which usually responds more favorably to a surgical procedure, and that spreading along the surface, which responds more favorably to irradiation. According to their histologic characteristics, he divided the growths into epidermoid, intermediary and undifferentiated types (the first type is radioresistant; the last two are sensitive to radiation), but he warned that a single specimen removed for biopsy may not give an accurate clinical picture of the entire growth. He divided the tumors according to location as follows: (1) cancer of the vestibule, involving the false vocal cords and the epiglottis and extending gradually to the other side and into the pyriform sinus (for this type treatment by irradiation is preferable), (2) cancer of the ventricle of Morgagni, which tends to extend into the subglottic region (for this type total laryngectomy is the preferable treatment), (3) cancer of the vocal cords (this type responds equally favorably to surgical procedures, frequently conservative, and to irradiation, but Hautant preferred surgical measures), and (4) cancer of the subglottic region (this type responds better to surgical methods). He stressed the value of roentgen study in the determination of the extent of the tumor. He considered pulmonary tuberculosis, cardiac insufficiency and advanced age as contraindications for surgical intervention. He has experimented in combining irradiation and surgical therapy, and he expressed the belief that with the constant advances in the technic of the irradiation this combination will improve the results of treatment. Irradiation is given before surgical intervention is undertaken to sterilize the outlying parts of the tumor rather than to destroy it totally. Healing is somewhat delayed when irradiation has preceded surgical intervention, but no serious disadvantage was noted.

Von Lénárt [23] reported 129 cases of epithelioma of the larynx and 1 of sarcoma of the larynx in which surgical treatment was given at the Budapest University Rhinolaryngologic Clinic. There were 33 thyrotomies and laryngofissures, 1 of which was performed on a patient suffering from sarcoma of a vocal cord. There were no deaths. Recurrences appeared in 5 cases (15 per cent); 22 patients (66 per cent) had been well from three to thirteen years when the report was written. Von Lénárt always packs the larynx tightly for eight to twelve days

23. von Lénárt, Zoltán: Zur chirurgischen Behandlung des Kehlkopfkarzinoms, Acta oto-laryng. **22**:83-104, 1935.

to avoid postoperative hemorrhage, inhalation of saliva and so forth. It is customary to remove the lymph nodes above the conus elasticus and along the jugular vein. In 4 cases of recurrence operation was successful. A subperichondrial resection of the larynx was performed in 17 cases. This operation performed with the help of the galvanocautery is indicated when the growth extends slightly into the subglottic region but not beyond the vocal process posteriorly and does not penetrate through the cartilage. At the time of writing there had been 2 deaths and 1 recurrence and 3 patients had been well for more than three years. Hemilaryngectomy was performed in 20 cases. The indication for this type of operation is the involvement of the entire side of the larynx, provided it does not extend across the midline posteriorly or into the epiglottis. Billroth's technic was followed. There were 3 deaths (15 per cent) and 6 recurrences (30 per cent). Nine patients (45 per cent) were well for three to fourteen years. Total laryngectomy was performed in 56 cases. The technic followed was that of Gluck, and the operation was almost always performed in one stage. The dissection was carried out from below upward in cases in which the tumor was completely intrinsic and from above downward when it extended into the pharynx or the entrance to the larynx. In 37 cases the lesion was intrinsic; there were 4 deaths (10.8 per cent) and 15 recurrences (40.5 per cent) and 12 patients (32.5 per cent) were well for more than three years. In the 19 cases in which the tumor was extrinsic, there were 5 deaths (26 per cent) and 8 recurrences (42 per cent) and 4 patients were well for more than three years (21.3 per cent). In 8 of the instances of recurrence the lesion was around the tracheal opening; in the others it was in the lymph nodes. Four patients with small growths of the epiglottis or the introitus of the larynx were operated on by the median transthyroid route. The mortality with this type of operation is far less than that with the subhyoid approach.

Falk [24] reported a case of tumor of the subglottic region in the larynx of a baby 8 weeks old. This proved to consist of thymus tissue and to be connected by strands through the space between the first tracheal ring and the cricoid cartilage with the thymus proper. Falk compared the findings in this case with those of endolaryngeal tumor of thyroid tissue, which is far more common. He found that both types of tumor occur in the same region and for the same reasons, which he discussed at length. Both these types of tumor appear at the time at which the normal organ of the same type develops—before birth in the case of the thymus and during puberty in the case of the thyroid gland.

24. Falk, Paul: Ueber ortsfremde, gutartige Gewebsbildungen, Thymus- und Thyreoideagewebe im Kehlkopf, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **141**:118-132 (July) 1936.

Koch [25] analyzed his results in the treatment of 22 patients with laryngeal papilloma. In 1 case roentgen therapy only was employed; 13 patients were repeatedly treated surgically and then by irradiation, and 7 were treated by irradiation immediately after the surgical removal of the papilloma. Koch concluded that papillomas differ in sensitivity to roentgen rays and the treatment should vary accordingly. Those made up of closer-knit, more cellular stroma responded better to irradiation. The best results were obtained with irradiation following surgical treatment, for 100 per cent of the patients were well at the time of writing.

Lambadaridès [26] reported the late results following roentgen therapy in 12 cases of laryngeal carcinoma. Six patients were living after an interval varying from thirteen months to nine years, 6 had died after surviving from a few days to three and one-half years. Lambadaridès expressed the belief that if it is properly applied, especially early in the course of the disease, roentgen therapy is to be preferred to surgical operation. His technic was described and a good bibliography given.

Jackson and Jackson,[27] in a short but clear article, described their technic for laryngofissure and Babcock's technic for laryngectomy. Their method for removing a growth involving the anterior commissure and the anterior portion of both vocal cords is interesting. They use an electric rotary saw to cut the cartilage and avoid cutting through the internal perichondrium. The internal perichondrium is separated from the cartilage to a point outside the limits of the growth before an opening is made into the cavity. The outstanding feature of Babcock's laryngectomy is the separation of the larynx from above downward and delay of its division from the trachea until the pharyngeal wound has been closed. Jackson and Jackson expressed their conviction of the importance of Broders' method of grading malignant tumor for making a choice of the method of operation and for determining prognosis. They described their criteria in selecting cases and their routine of preoperative and postoperative care. Pneumonia was a rare complication in the cases observed by them, but atelectasis caused by the inhalation of foreign materials was fairly frequent. They recommended bronchoscopy and suction in all cases in which this condition is suspected. They expressed the belief that the newer technic of

25. Koch, Johannes: Die Bedeutung der Bestrahlungstechnik und des Gewebsaufbaus für den Erfolg der Röntgenbestrahlung von Larynxpapillomen, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **142**:83-96 (Oct.) 1936.

26. Lambadaridès, A.: Einige Spätresultate bei Kehlkopfkrebsen nach Strahlenbehandlung, Strahlentherapie **53**:630-650, 1935.

27. Jackson, Chevalier, and Jackson, C. L.: Malignant Disease of the Larynx: Its Treatment by Laryngofissure and Laryngectomy, Am. J. Surg. **30**:3-17 (Oct.) 1935.

roentgen therapy is capable of producing remarkable palliative results and cures and that the indication for this conservative treatment is increasing.

TRACHEA

Abbate [28] reported a case of sarcoma of the trachea in a girl aged 10 years. Reports of only 3 other similar cases were found in the literature. The tumor was removed through a tracheotomy opening, and radium was later applied directly into the tracheal cavity by means of a special carrier, which permitted the passage of air around the tube containing the radium. The child was well a year later. The literature was reviewed.

ESOPHAGUS

King [29] reported a case of successful removal of the middle portion of the esophagus for carcinoma in a woman aged 56. The surgical approach was posteriorly through the pleura. An interesting point in treatment was the preliminary artificial pneumothorax, which did away with the sudden shock of opening the pleural cavity in the course of the operation. Negative pressure was reestablished after operation by means of suction applied to the wound. The author expressed the belief that the avoidance of infection is the main requisite for success and advocated oral hygiene as one of the most necessary steps in this direction. Another observation of interest was the fact that the patient was slow to regain weight and strength as long as saliva was allowed to escape from the upper stump of the esophagus and was not utilized.

A case in which a pedunculated squamous cell carcinoma of the upper portion of the esophagus was removed by means of surgical diathermy through the endoscope was reported by Moersch.[30] He expressed the belief that this was the first instance of the use of surgical diathermy in the removal of tumor of the esophagus. The patient returned with a slight local recurrence a month later. The diathermic coagulation was repeated, and the patient had remained well for six months at the time the report was written. There was little or no unfavorable reaction to this form of treatment.

Newland [31] briefly reported the successful removal of the cervical portion of the esophagus for carcinoma. The patient died three months

28. Abbate, Luigi: Luftröhrensarkom beim Kinde. Erfolgreiche endotracheale Radiumbehandlung, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **140**:179-186 (Oct.) 1935.

29. King, E. S. J.: Oesophagectomy for Carcinoma of the Thoracic Esophagus, Brit. J. Surg. **23**:521-529 (Jan.) 1936.

30. Moersch, H. J.: Carcinoma of the Esophagus Removed by Surgical Diathermy, Proc. Staff Meet., Mayo Clin. **10**:433-435 (July 10) 1935.

31. Newland, Henry: Cervical Oesophagectomy for Carcinoma, Australian & New Zealand J. Surg. **5**:187-190 (Oct.) 1935.

later, after a plastic reconstruction of the esophagus. No metastasis or recurrence was found.

Turner [32] gave a fascinating discussion of the problem of surgical removal of a malignant tumor of the esophagus. From his experience in 19 cases in which the growth was actually removed, he argued that this type of growth is not the completely hopeless problem it has been considered to be and that at present it is a surgical problem rather than one of radiotherapy. He expressed the belief that the cause of failure in those cases in which the condition presented is favorable as regards extent, mobility and lack of metastasis is lack of technical preparation and knowledge. Many interesting facts are contained in his article. He reviewed the anatomy, bringing out the fact that the esophagus is essentially free from fixation and lies as if in a tunnel of areolar tissue. This makes it possible to employ the "pull-through" method of removal of the diseased portion without great danger. Rupture of the pleura presents one of the main dangers of operation on the esophagus; mediastinitis, another. He further noted that although the esophagus is greatly distensible, it is not very extensible and that if more than 4 cm. has to be removed, as is usually the case, an end to end anastomosis is not possible without excessive tension. An artificial esophagus may be fashioned later out of skin. The portion just above the diaphragm is poorly supplied with blood, and this is another source of danger. Turner advocated thorough investigation by roentgen rays, endoscopy and palpation, and if doubt still remains as to the clinical indication for operation, an exploratory operation. It is impossible to go into detail as to the various forms of approach and technic in a short abstract, but the entire article well merits reading. The point is made that all patients complaining of dysphagia or obstruction are potential victims of cancer of the esophagus and the esophagus should be immediately investigated by all the methods at the disposal of medical scientists. Turner agreed with Jackson that cancer of the esophagus tends to be slow in development and late to metastasize.

Edwards [33] reported the successful removal of the entire thoracic portion of the esophagus by the transpleural route in a patient suffering from basal cell carcinoma of the lower third of the esophagus. The operation was preceded by artificial pneumothorax of the left lung. In the course of the operation the right pleura had to be opened, and positive pressure was applied to the right lung. After operation the air was aspirated from both pleural sacs, and the lungs were reexpanded without difficulty.

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32. Turner, G. G.: Carcinoma of the Oesophagus: The Question of Its Treatment by Surgery, Lancet **1**:67-72 (Jan. 11); 130-134 (Jan. 18) 1936.

33. Edwards, A. T.: Transpleural Removal of Total Thoracic Oesophagus, Proc. Roy. Soc. Med. **29**:188-190 (Dec.) 1935.

Mathews and Schnabel [34] reviewed 108 necropsies in cases of carcinoma of the esophagus. The salient point of their report was the discovery that 20.3 per cent of the lesions were nonstenosing and had caused no symptoms referable to the esophagus. Further interesting facts were the comparatively brief survival of patients with this type of involvement and the apparent lack of relationship between the activity of the growths as measured by the Broders' classification, the clinical course and the tendency to stenosis. Mathews and Schnabel concluded that in cases in which there are loss of weight, pain in the chest, vomiting and hoarseness but roentgenologic findings are negative, esophagoscopy should be employed.

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34. Mathews, R. W., and Schnabel, T. G.: Primary Esophageal Carcinoma, with Especial Reference to a Nonstenosing Variety: A Clinicopathologic Study Based on One Hundred and Eight Necropsies, J. A. M. A. **105**:1591-1595 (Nov. 16) 1935.

News and Comment

ADVISORY BOARD FOR MEDICAL SPECIALTIES

The annual meeting of the Advisory Board for Medical Specialties, which is the coordinating board of the twelve certifying boards in the various special fields, the Association of Medical Colleges, the American Hospital Association, the Federation of State Medical Boards of the United States and the National Board of Medical Examiners, was held at Atlantic City, N. J., on June 6, 1937.

The following officers were elected: president, Willard C. Rappleye, M.D., New York; vice president, W. P. Wherry, M.D., Omaha; secretary-treasurer, Paul Titus, M.D., Pittsburgh; executive committee, W. B. Lancaster, M.D., Boston, and R. C. Buerki, M.D., Madison, Wis.

Dr. Louis B. Wilson, of Rochester, Minn., the retiring president of the board, was elected an emeritus member.

THE AMERICAN BOARD OF OTOLARYNGOLOGY

An examination was held in Philadelphia on June 7 and 8, 1937, prior to the meeting of the American Medical Association. Ninety-four candidates were examined; of this number, seventy-two were certified.

An examination will be held in Chicago on Oct. 8 and 9, 1937, before the meeting of the American Academy of Ophthalmology and Otolaryngology. Prospective applicants for certification should secure application blanks from the secretary, Dr. W. P. Wherry, 1500 Medical Arts Building, Omaha.

Abstracts from Current Literature

Ear

PHYSICAL IMPAIRMENTS OF DEAF CHILDREN. G. L. DRENNAN, Illinois M. J. **70**: 254 (Sept.) 1936.

In a survey of fifty-eight children entering the Illinois School for the Deaf in 1936, Drennan and his associates found that 56.9 per cent came to that institution as a result of acquired deafness, and 39.6 per cent were congenitally deaf. A congenitally deaf child, they found, may be the victim either of frankly hereditary forces or of an obscure lesion. Owing to the constant intermarriage between deaf-mutes and the fact that speaking and hearing members of such families often have deaf-mute children, congenital deaf-mutes have been increasing in number.

Drennan believes that it cannot be emphasized too strongly that most deafness is partial and acquired. Deafness of all types is more easily prevented than cured, and the efforts toward prevention of deafness cover the entire field of biologic activity.

Meningitis was the etiologic factor in 27.2 per cent; whooping cough, in 18 per cent. All those deaf as a result of whooping cough were deafened before they were 1½ years of age. Measles was the cause in 11.8 per cent of the cases; scarlet fever, in 6 per cent. Following these, there were causes such as congenital syphilis, undiagnosed fever, mastoiditis, otitis media, fracture of the skull, injury to the head, typhoid and summer complaint (cholera morbus). Of the group studied 73 per cent became deaf before the age of 5 and 64 per cent before the age of 2. Among those under 2 years of age, whooping cough and meningitis were each the cause in 28.5 per cent, and measles in 9.5 per cent. The control of infectious diseases and skilled attention to the ears when complications are present will do much to diminish the frequency of deafness from these causes.

This group of fifty-eight children studied from the point of view of general physical defects exclusive of deafness presented an interesting challenge; that is, 90 per cent of the group showed one or more physical defects besides that for which they were admitted to the school; 80 per cent showed defects which necessitated medical attention. Of the group who were deafened by 2 years of age, 100 per cent showed other physical defects. The need to prevent these physical defects antedates the school age by five and a half or six years. Proper care in infancy and immunization against diseases for which active immunizing agents are available will accomplish much toward perfecting the development of children. Early diagnosis of the infectious diseases and prompt administration of indicated antitoxins, vaccines or antiserums are important in preventing the dire complications, which are frequently more serious than the disease itself.

BARBOUR, Peoria, Ill. [AM. J. DIS. CHILD.]

NERVES OF THE DURA MATER OF THE POSTERIOR CRANIAL FOSSA AND THEIR IMPORTANCE IN THE DIAGNOSIS AND SURGICAL TREATMENT OF PETROSITIS. C. F. PORTA, Arch. ital. di otol. **48**:289 (May) 1936.

Porta made an anatomic study of the innervation of the dura mater of the posterior cranial fossa and found that it is constituted by the trigeminus nerve through the ophthalmic nerve and by the vagus through the posterior branch of the meningeal nerve from the jugular ganglion. Because of the relations of these nerves with those of the dura of the petrous bone and of the special innervation of the latter, the author states that the retro-orbital and occipital pain that are constant in petrositis originate, respectively, in the ophthalmic branch of the gasserian ganglion and in either Arnold's nerve (a branch of the ophthalmic nerve) or the branch of the meningeal nerve of the vagus. The type of pain—retro-orbital or

occipital—is of diagnostic value for the presence of petrositis, for determination of the location of the petrositic process and, in this connection, for the selection of the petrositic cells, either anterior or posterior, which should be opened at the operation.

EDITOR'S ABSTRACT.

CLASSIFICATION OF INFLAMMATIONS OF THE PETROUS PYRAMID. A. TOBECK, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **141**:61, 1936.

In this report Tobeck aims to bring order into the confusing and partly misleading terminology of the otogenic, inflammatory, extralabyrinthine processes of the petrous pyramid. He bases his classification of these disorders on the anatomic and structural conditions of the pneumatized or non-pneumatized petrous pyramid. He further emphasizes the importance of the correct evaluation of the inflammatory histopathologic changes in applying terms to the various subgroups of inflammation of the pyramid.

In giving attention to these factors he was able to devise a classification which does justice to all clinical as well as pathologic-histologic requirements. For the main group, which includes all subgroups, he recommends the term otogenic extralabyrinthine pyramidal inflammation. He also differentiates two subgroups: (1) the suppuration of the pyramidal cells with its various subtypes and (2) osteomyelitis of the pyramid.

EDITOR'S ABSTRACT.

POSITIONAL VERTIGO AND VERTIGO-PRODUCING POSITION; POSITIONAL NYSTAGMUS AND NYSTAGMUS-PRODUCING POSITION. E. RUTTIN, Monatschr. f. Ohrenh. **70**:257 (March); 455 (April); 523 (May) 1936.

Ruttin defines as positional vertigo the vertigo that develops when the head or the head and body change position and as vertigo position that position which produces vertigo. In the same manner he defines positional nystagmus and nystagmus position. In this paper he reports and discusses a number of carefully observed cases that throw some light on this phenomenon. He disregards the various labyrinthine disorders in which every shifting of the head or of the head and body elicits vertigo and nystagmus, having discussed them in a previous report. Under the heading of positional vertigo and positional nystagmus he wishes to take up only those cases in which one or several definite positions result in vertigo and nystagmus. He assumes that a pathologic process of the vestibular apparatus (in the restricted sense), that is, of the utriculosaccular apparatus or its central portions, is the causal factor in these cases. To be sure, there are cases in which the utriculosaccular apparatus as well as the semicircular canals are involved. Among the types of nystagmus that are elicited by disturbance of the semicircular canals, the horizontal and rotatory types are generally accompanied by a shifting of the vertical meridian, and the vertical type, by a shifting of the equator of the cornea. For horizontal and vertical nystagmus this is readily understandable, since there is no inclination of the meridian but only a shifting. However, in rotatory nystagmus there are shifting and inclination of the meridian. It must be noted that the nystagmus which frequently develops in the cases of pure positional nystagmus shows pure rotation, that is, only inclination of the meridian, without shifting, or pure wheel turning. The author designates this latter type of nystagmus as "wheel-turning nystagmus" and emphasizes that there are not three but four basic forms of nystagmus: horizontal, vertical, rotatory and wheel turning. His observations indicate that this wheel-turning nystagmus is characteristic for pathologic changes in the utriculosaccular apparatus, whereas the horizontal, rotatory and vertical types of nystagmus indicate involvement of the semicircular canals.

After an analysis of several groups of cases, the author concludes that the diseased as well as the healthy side may be in the nystagmus position and the nystagmus position may elicit homolateral and contralateral nystagmus, irrespective

of whether it is the diseased or the healthy side. Thus, the cases demonstrate that neither the nystagmus-producing position nor the direction of the positional nystagmus permits a conclusion as to the side of the lesion. This impossibility to deduce the side of the localization of the pathologic process from the nystagmus position or from the direction of the positional nystagmus applies even to cases of cerebral tumor.

EDITOR'S ABSTRACT.

CLINICAL ASPECTS OF CONCUSSION OF THE EAR BY A STROKE OF LIGHTNING. GLADKOFF, Monatschr. f. Ohrenh. **70**:289 (March) 1936.

Gladkoff reports observations on several patients who sustained injuries from lightning. One patient, who had been at the telephone when lightning struck, had the sensation of falling from a great height. He sustained second and third degree burns on the left shoulder, in the axilla, on the abdomen, on the scrotum and on the leg. The author reports the results of examination of the cochlear and the vestibular apparatus. The cochlear function was reduced. The examination of the vestibular apparatus disclosed no spontaneous nystagmus, and changes in the position of the head produced no pathologic reflexes, although the anamnesis revealed severe labyrinthine reactions (feeling of a fall from a great height and cerebral vertigo).

The author further describes the results of examination of four other patients. The patients complained of a greater or lesser impairment of hearing, particularly immediately after the lightning had struck, and of noises in the ears. One patient had petechial hemorrhages in the tympanic membrane and hyperemia of the auditory meatus. In another patient a blood clot was found in the center of a dry perforation. The region behind the ear was burned in this patient. In two other patients, in whom the lightning had left no visible traces on the head, the author observed reduction of the air conduction for low as well as high sounds. The impairment of hearing was greater on the side on which the lightning had struck. The bone conduction was reduced in all cases. The Weber reaction was lateralized in the direction opposite to the side on which the lightning struck.

EDITOR'S ABSTRACT.

SURGICAL CURETTEMENT OF THE PETROUS PYRAMID. S. UNTERBERGER, Ztschr. f. Hals-, Nasen- u. Ohrenh. **39**:381, 1936.

Unterberger says that in case of suppuration of the petrous apex in the course of acute or chronic otitis media with or without Gradenigo's syndrome, the customary surgical methods are often inadequate to insure drainage of the pus and to prevent or cure meningitis. He describes a new method for the opening and curetting of the suppurating pyramidal apex by way of the internal ear, not from the posterior cranial fossa but rather from the middle fossa and not, as formerly, through the entire internal ear but through only the attic of the internal ear above the facial nerve and the internal auditory meatus, which in its attic portion near the fundus is opened in this intervention.

The author maintains that this is the shortest way to the pyramidal apex, it being much shorter than the way through the internal ear from the posterior cranial fossa. Another advantage is that it is much less dangerous. There is no interference with the sigmoid sinus and with the bulb of the jugular vein, as is the case in the method in which the approach is by way of the posterior cranial fossa. Moreover, the internal auditory meatus is not opened in such a manner that it is entirely obliterated so that portions of the brain will push forward and cause obstruction. The facial nerve is better protected than in the other method. The removal of the interfering portions of the labyrinth is considerably facilitated, for chiseling on a precipitous and extremely hard bone surface with the added danger of possible injury to the dura mater, which is necessary in case of approach from the posterior fossa, is avoided in the author's method. During the

entire intervention the petrosa itself remains tightly connected with the tabular part of the occipital bone and with the other parts of the temporal bone. Thus, there is no danger that it may break off and make difficult or impossible the further penetration of the apex. Moreover, the method provides a better survey and more effective drainage than do other procedures. EDITOR'S ABSTRACT.

MILIARY TUBERCULOSIS AND OTITIS MEDIA. E. ZIEGLER, Ztschr. f. Hals-, Nasen- u. Ohrenh. **39**:391, 1936.

Ziegler points out that the literature contains reports of numerous cases in which miliary tuberculosis with simultaneously existing suppuration of the middle ear was regarded as otogenous sinus thrombosis or a cerebral abscess or caused other diagnostic difficulties. He thinks that his report of a series of ten cases, all of which were observed at the same clinic, permits a better estimate of the symptomatology and the differential diagnosis than does the study of single cases. A survey of the reported cases reveals the difficulty of recognizing at all or early enough the miliary tuberculosis that occurs with otitis media, for in only three of eight cases was the miliary tuberculosis suspected or detected while the patient was still alive. The author analyzes once more the various symptoms in order to throw light on the points that are important for early recognition. He takes up miliary dissemination, productive, caseous and cirrhotic tuberculosis, the general manifestations and the indications for surgical intervention. He says that suspicion of miliary tuberculosis should not cause the postponement of a necessary operation. In the conclusion he expresses the hope that his report has sharpened the perception for recognition of miliary tuberculosis in cases of a simultaneously existing otitic disorder. EDITOR'S ABSTRACT.

A METHOD OF TESTING ONE EAR. H. MEISSNER, Ztschr. f. Hals-, Nasen- u. Ohrenh. **39**:415, 1936.

Meissner points out that it is often necessary to test the hearing capacity of one ear, particularly of one with impaired hearing. In this case it is important but difficult to exclude the hearing of the normal ear. He mentions and evaluates the methods that have been tried to accomplish this and states that at his clinic an electrical noise apparatus has been developed by Langenbeck.

With this apparatus the author made tests similar to those which Bunch reported having made with an American electrical noise apparatus. His experiments were made on normal persons and on persons with deafness of one ear. He found that whenever it is essential to deafen one ear completely in order to determine the deafness of the other, it is advisable to use an electrical noise apparatus, for these deafen completely and do not produce artificial deafness in the other ear. This is of practical importance in deciding the advisability of a labyrinthine operation and in the diagnosis of tumor of the brain. With the electrical noise apparatus of Langenbeck the author succeeded in completely excluding the hearing of one ear, without greatly impairing that of the other ear. Thus, he was able to corroborate the results obtained by Bunch, but he admits that a correct technic is important. In experiments on persons with unilateral deafness, it was determined that even if a headphone is used which is well sealed against the air and well isolated against bone conduction, a measurable portion of sound reaches the other ear and that the hearing capacity of an impaired ear cannot be exactly determined if it is approximately 60 decibels less than that of the other ear. In such cases, an electrical noise apparatus must be used. Tests on persons with unilateral conduction deafness or deafness of the internal ear should be made with both methods. The author thinks that in this manner simulation of unilateral deafness can be determined. EDITOR'S ABSTRACT.

Pharynx

CONTROL OF TONSIL AND ADENOID BLEEDING. LOUIS M. PEARLMAN, M. Rec. **143**:194 (March 4) 1936.

In the removal of tonsils and adenoids the surgeon meets with factors peculiar to bleeding from tonsils and adenoids: 1. It is difficult to see and to grasp the bleeding vessels because they are hidden by the soft palate and the anterior pillars and by the tongue. 2. The teeth constitute another barrier. 3. Blood may be swallowed for some time and remain unobserved until it is vomited. 4. The parts operated on cannot be placed entirely at rest. 5. The parts cannot be aseptically dressed. 6. A clot formed in the tonsillar fossa is prone to stimulate further bleeding by stretching the tonsillar fossa. A history of bleeding should make the physician take all the usual preventive measures before operation. Treatment should be instituted at once directly to the bleeding parts. Pearlman recommends and discusses the following agents for stopping the bleeding: (1) a lamb's wool tampon, (2) artery clamps, (3) chemical cautery, (4) posture and (5) astringent drinks.

Reports on six cases conclude the article.

WILLIAMSON, New Orleans. [AM. J. DIS. CHILD.]

TRANSITORY BACTEREMIA FOLLOWING TONSILLECTOMY. FISCHER and GOTTDENKER, Wien. klin. Wchnschr. **49**:177 (Feb. 7) 1936.

Among the explanations which Fischer and Gottdenker offer for the recrudescence of an old process, such as nephritis, polyarthritis or endocarditis, or the causation of a new disease, such as septicemia, following a tonsillectomy are: transmission of bacteria from the wound to the blood stream, resorption of exotoxins or endotoxins from the surface of the wound and an allergic reaction in which bacterial proteins are resorbed by the wound and act as allergens. The object of the investigation was to determine whether the first of these conditions, namely, the entrance of bacteria into the blood stream, is possible after tonsillectomy.

The authors made investigations of the blood (obtained from the cubital vein) five minutes before and five minutes after tonsillectomy and also two, twelve and twenty-four hours later. Among fifty-one patients thus investigated, sixteen showed the presence of bacteria in the blood stream after tonsillectomy. The maximum bacteremia was observed two hours after the operation. From twelve to twenty-four hours after operation the blood was always sterile. In the sixteen cases in which organisms were present the following bacteria were found: anhemolytic streptoccoci, seven times; pneumococci, once; Staphylococcus aureus-haemolyticus, three times; Staphylococcus albus, twice, and Staphylococcus aureus-anhaemolyticus, three times. A relation between the bacteria cultivated directly from the tonsils and those from the blood could not be proved. The indications for tonsillectomy were recurrent sore throat with or without general symptoms (polyarthritis or endocarditis). The operation was usually undertaken some time after the angina had subsided and only once immediately after an attack. For control, the blood of fifteen patients who underwent other operations, such as resection of the septum, was observed. In one case Staph. aureus-anhaemolyticus was found; in the remaining cases blood cultures were sterile.

Schwarz and Frisch noted bacteremia in three of eleven patients immediately after tonsillectomy. Two hours after tonsillectomy Bartlett and Pratt found streptococci in 6 per cent of the cases. Wirth could find no evidence of bacteremia after tonsillectomy in forty-five patients.

ABT, Chicago. [AM. J. DIS. CHILD.]

DIFFICULTIES OF HISTOLOGIC DIAGNOSIS OF MALIGNANT PROCESSES OF THE EPIPHARYNX. K. WOLFF, Ztschr. f. Hals-, Nasen- u. Ohrenh. **39**:344, 1936.

Wolff directs attention to the great service rendered by Gräff in showing that in malignant tumor with obscure origin the primary focus may be in a locality

which hitherto has received little attention in the postmortem examinations, namely, the nasopharynx and its accessory cavities. Gräff's merit is especially great, because he also devised a method that permits exposure of the nasopharynx, which gives a good survey over the region.

The author describes two malignant processes of the epipharynx, in which the new technic of Gräff was employed. The cases are especially noteworthy because of the peculiar manner in which the processes spread and particularly because they show the histologic-diagnostic difficulties that are encountered in the examination of a single section. In the first case, the postmortem examination confirmed the existence of a tumor of the epipharynx. The lymph nodes of the neck had nearly all become transformed into tumor-like nodules. The lymph nodes of the pulmonary hilus were likewise enlarged. However, the case history contains nothing regarding hyperplasia of the lymphatic tissues of the intestine. The most surprising aspect was presented by the stomach, for tumor nodules were found in all portions of its mucous membrane. The tumor in the epipharynx gave at once the impression of a malignant growth.

After giving a detailed description of the histologic aspects, the author says that on account of the various cell forms it might be justifiable to think of "the peculiar tumors suggesting granulomas," which Krauspe had observed in the upper air passages and in the digestive tract. Krauspe suggested the term sarcomatous reticuloendotheliosis. Wolff says that in the reported case a sarcoma existed, which originated in the reticulum. After demonstrating that the process was neither lymphogranulomatosis nor lymphosarcoma, he concludes that the growth was a retotheliosarcoma. In the second case the aspects of chronic inflammation predominated. However, a cervical lymph node revealed signs of malignant growth. In the conclusion Wolff emphasizes once more that in case of a tumor in the region of the neck, in which the origin is obscure, the region of the nasopharynx should always be carefully examined.

EDITOR'S ABSTRACT.

Nose

SINUSITIS IN CHILDREN. LAWRENCE K. GUNDRUM, Arch. Pediat. **53**:287 (May) 1936.

The subject of sinusitis is reviewed by Gundrum. The type most frequently seen in children is a low grade catarrhal sinusitis. The treatment which the author has found most successful is the displacement irrigation suggested by Proetz. The medicament used is either 0.5 per cent ephedrine in a physiologic solution of sodium chloride or 0.5 per cent phenol in light liquid petrolatum. The author states that recently he has had favorable results with diluted bacterial antigens. Slightly better results were obtained by the use of stock rather than autogenous antigens.

The treament consists of a 10 per cent solution of bacterial antigen in a 0.125 per cent solution of neosynephrin in a physiologic solution of sodium chloride. The concentration of the antigen is gradually increased until a maximum of a 50 per cent to 100 per cent solution is reached. The stock antigen consists of staphylococci, streptococci and Bacillus coli.

Three case reports are included in the paper.

ORR, Buffalo. [AM. J. DIS. CHILD.]

INDICATIONS FOR SURGICAL TREATMENT OF SUPPURATIONS OF THE MAXILLARY SINUS. F. IPOLYI, Monatschr. f. Ohrenh. **70**:401 (April) 1936.

Ipolyi thinks that a puncture of the sinus should be made in every case in which the presence of suppuration has been determined or in which the subjective or objective symptoms, the diaphanoscopy or the roentgenogram indicate the presence of such a process. A puncture giving a positive result should always be followed by irrigation. New suppuration usually yields to this treatment

However, if the symptoms of perforation become noticeable or the tension is too severe on account of an excessive amount of pus, a wide endonasal opening is advisable. Thus, the evacuation of the secretion is facilitated and can eventually be accelerated by daily irrigation. A radical operation is rarely necessary in acute cases; only if the severe symptoms do not disappear after the wide opening and if necrosis or perforation must be suspected, is such an intervention justified. Systematic irrigation counteracts even a considerable percentage of the chronic suppurations. At the author's clinic, irrigations are usually tried for from five to six weeks. If this treatment does not effect cure, a more extensive intervention is resorted to, such as a wide opening. A radical operation is necessary only if irreparable changes have taken place in the mucous membrane. The Luc-Caldwell method is the radical operation that is most often resorted to at the author's clinic, because it gives a good survey, causes the least dental complications and does not cause disfigurement. Denker's operation is performed at his clinic if interventions on the ethmoid and the sphenoid sinus are required simultaneously and in case of tumor. Of 1,413 patients with empyema of the maxillary sinus, who came up for treatment at the clinic in the course of eleven years, the condition of 921 responded to irrigation; in 320 it was cured by the wide endonasal opening made according to the Lathrop-Claoué method, and in 167 it required radical operation (the Luc-Caldwell, Denker or Sturmann procedure).

EDITOR'S ABSTRACT.

CONGENITAL EPITHELIAL DUCTS AND CYSTS OF THE BACK OF THE NOSE. C. E. BENJAMINS, Nederl. tijdschr. v. geneesk. **80**:1886 (May 2) 1936.

Benjamins delivered a clinical lecture on some observed cases of congenital cysts and ducts of the back of the nose, which never communicate with the cavity of the nose and which show an exclusively dermoid character. Especially toward puberty further development is possible. The source of the deviations is extensively discussed. The treatment should always be surgical.

VAN CREVELD, Amsterdam, Netherlands. [AM. J. DIS. CHILD.]

Miscellaneous

PATHOLOGIC HISTOLOGY OF THE CRICO-ARYTENOID JOINT. L. HÖRBST, Monatschr. f. Ohrenh. **70**:48 (Jan.) 1936.

Hörbst points out that the literature contains several reports on inflammatory changes of the crico-arytenoid joint in rheumatism, typhoid, gout, gonorrhea and other conditions. However, since there is as yet no record of systematic examination of this joint and its histologic changes under various conditions, it is the author's aim to supply information about this problem. In the course of examination of thirty-four crico-arytenoid joints, he observed changes of the capsule as well as of the cartilaginous and the bony portions of the joint. The incidence of the interruptions in continuity and the formation of large synovial villi that are frequently rolled up or in balls in the variformed bays of the capsule indicate that their development is related to the articular movements that take place under physiologic conditions. Occasionally, detached villi are pushed into the articular space, and here they undergo hyalinization and calcification. The pathogenesis of the changes of the cartilaginous covering of the joint are explained with consideration of the function of the joint. The cartilaginous covering nearly always shows loosening and fraying in its surface layer as well as areas of wearing down and formation of villi. The superficial fraying out and wearing down either of the socket or of the head of the joint cause roughness of the surface, and further wearing down may result in disappearance of the cartilaginous covering. In addition to these changes resulting from mechanical wear on the articular surfaces, Hörbst in two cases observed at the osteocartilaginous margin small foci of traumatic destruction, which were filled with granular detritus. In three cases

he detected that as a result of these mechanical and traumatic impairments of the articular cartilage, medullary spaces and vascular formations had penetrated through the zone of calcification of the articular cartilage into the uncalcified cartilage. In this connection Hörbst calls attention to studies by Pommer and Lang, which revealed that such processes of vascularization and ossification of the articular cartilage characterize the beginning stage of arthritis deformans.

EDITOR'S ABSTRACT.

SUPPURATION OF THE MIDDLE EAR, ACCESSORY NASAL SINUSES AND PHARYNX IN PATIENTS WITH DIABETES. B. KECHT and H. DIBOLD, Ztschr. f. Hals-, Nasen- u. Ohrenh. **39**:288, 1936.

Kecht and Dibold point out that in operations on the ear, nose and throat, as in all surgical interventions, the existence of diabetes mellitus involves special indications and contraindications. After mentioning the indications and contraindications, the authors discuss the preparation of the diabetic patient for surgical treatment and then describe their own observations on seventeen cases of suppuration of the middle ear and on three cases each of suppuration of the accessory nasal sinuses and of peritonsillar suppuration. On the basis of these observations they conclude that the course of acute otitis media is different in diabetic patients in that it leads to mastoiditis more often than in nondiabetic patients.

The mastoiditis of diabetic patients as a rule shows no peculiarities; a deficiency of symptoms could not be observed. The mortality for mastoiditis was higher in the diabetic patients when it was compared with the mortality of nondiabetic patients of all age groups (23.5 per cent compared to 10.9 per cent); however, it is approximately the same if only the older patients are taken into consideration. In young persons, the prognosis is on the whole rather favorable, even if the diabetes is severe. However, in older persons (beyond the age of 55) with other disorders, such as tuberculosis, vascular disease, anemia or cachexia, the prognosis is unfavorable. In this latter group of patients it is therefore advisable to operate early, whereas in younger persons an expectant attitude is permissible. Suppuration of the accessory nasal sinuses and peritonsillar suppuration have no unusual aspects in diabetic patients. From the internistic point of view, the authors emphasize that the existing suppuration exacerbates the metabolic disorder and that there is improvement as soon as the focus of suppuration is removed. For this reason a surgical intervention is more urgent for diabetic than for nondiabetic patients.

EDITOR'S ABSTRACT.

Society Transactions

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY

Regular Monthly Meeting, April 5, 1937

IRA FRANK, M.D., *President*

WALTER H. THEOBALD, M.D., *Secretary*

PROGRAM PRESENTED BY UNIVERSITY OF ILLINOIS COLLEGE OF MEDICINE

SWELLINGS OF THE NECK. DR. R. B. MALCOLM (by invitation).

The following cases were observed:

Tumors and cysts	250	Location of tumors and cysts:	
Tuberculous adenitis	100	Submaxillary triangle	72
		Carotid triangle	163
Total	350	Muscular triangle	15
Origin: Epiblastic		Origin: Mesoblastic	
Cysts	46	Cysts	2
Tumors	127	Tumors	25
Benign	28	Benign	12
Malignant	99	Malignant	13
		Hodgkin's disease	40
		Leukemia	10

Submaxillary Triangle.—The lesions in the parotid gland included the following: benign tumors, 23—mixed tumors, 22; papillary cystadenoma, 1; malignant tumors, 15—adenocarcinomas, 12; squamous cell tumors (papillary), 2; cystadenocarcinoma, 1.

The results in benign tumors were excellent, although there were some instances of recurrence requiring a second operation. The results in malignant tumors were disappointing. Four adenocarcinomas developed in previously existing mixed tumors.

The lesions of the submaxillary salivary gland included 3 cysts, 4 mixed tumors and 1 adenocarcinoma.

Two cysts of the sublingual salivary gland were observed.

There were 30 resections of the submaxillary triangle for carcinoma of the lip, 6 for metastatic carcinoma and 2 for malignant melanoma.

Cyst of the thyroglossal duct was observed 20 times. The result in 19 lesions was excellent; 1 required a second operation. Cystic hygroma was observed once.

Carotid Triangle.—Branchial cyst was observed in 19 cases. The results in all these were excellent. In every case the cyst arose from the second cleft. In every case it was deep to the posterior belly of the digastric muscle and superficial to the stylopharyngeal muscle and lay between the external and the internal carotid artery.

Branchiogenic carcinoma was observed in 4 cases. In 3 resection was performed and the jugular vein was taken away. Two patients died within a week after the operation; the third lived eighteen months. In the fourth case the growth involved the vein and the carotid arteries in a woman aged 70; so no attempt was made to remove it.

Tumor of the carotid body was observed in 2 cases. In the first case the growth was a malignant tumor, and attempt at removal was unsuccessful. The patient died some months later. The diagnosis was ganglioneuroblastoma. In the second case a woman aged 37 had a small mass in the region of the bifurcation of the carotid artery. The mass was thought to be a lymph node, but on exposure the color made the diagnosis. It was successfully removed, the adjacent sheath of both carotid arteries being taken with the tumor. The blood pressure at the commencement of the operation was 120 systolic and 80 diastolic, and on traction on the tumor it fell to 70 systolic and 50 diastolic. When the tumor and the nerve attached to it were removed, the pressure went up to 100 systolic and 75 diastolic. After the operation the pressure went up to 180 systolic and 80 diastolic. It persisted at that level for several months and gradually came down to normal. Microscopic examination showed an adenoma of the carotid body, measuring 6 by 4 by 3 cm.

Metastatic carcinoma was observed 73 times. The tumors were secondary to carcinoma in the tonsil, pharynx, tongue, lip, larynx, esophagus, thyroid gland, stomach and even the lung, adrenal glands and other areas, which could not be differentiated. Of particular interest were 4 metastatic hypernephromas and 4 neurocytomas.

Lymphosarcoma was observed in 8 cases; in 5 the growth was of the lymphocytic type and in 3 of the reticulum cell type. This group was of particular interest on account of the variation in size and the softness to the touch. Clinically, this condition resembles Hodgkin's disease.

Other tumors of mesoblastic origin included: fibrosarcoma, 2; lipoma, 9. These were all subfascial and were of the dissecting type, so that when they were completely removed practically the whole neck was exposed.

Lymphangioma was observed in a child aged 10 years. On removal, the growth was found to arise from the radicles of the right lymphatic duct. Neuroma was observed in 1 case and neurofibromatosis in 1.

Hodgkin's disease was observed 40 times. This series gave the greatest variation in the histologic changes. In some cases it was difficult to differentiate them from those in lymphosarcoma.

Leukemia was observed in 10 cases. The only operation was removal of tissue for biopsy except in 1 case, in which I did a total thyroidectomy as an experiment to reduce the basal metabolic rate, hoping to improve the condition. The patient died in six weeks.

Muscular Triangle: All the 15 cases of swelling in the muscular triangle were instances of carcinoma of the thyroid gland. The results following thyroidectomy and in some cases removal of the adjacent involved lymph nodes were disappointing. One interesting case was observed in a girl aged 11 years.

All these cases are from the records of the Research and Educational Hospital of the University of Illinois College of Medicine or from my private practice.

ROENTGEN RAY STUDIES OF THE SOFT TISSUES OF THE NECK. DR. PAUL H. HOLINGER (by invitation).

The soft tissues of the neck lend themselves readily to roentgen study. This is due to the variation in density of the gross structures. The trachea, entirely hollow and containing air, serves as a perfect background against which the soft structures and the laryngeal cartilages may be silhouetted.

Such studies, both anatomic and pathologic, have been carried on since shortly after Roentgen's discovery; of note are the works of Sheier, Thost, Iglauer, Hay, Mosher and the Jacksons.

The value of roentgen studies of the soft tissues of the neck is dependent on cooperation between the roentgenologist and the laryngologist. The final evaluation of the pathologic condition must be made by comparison of the direct observations and the roentgenograms, one study supporting the other.

For infants and children, as well as in adults for whom indirect examination of the hypopharynx and larynx is impossible, the roentgenogram is indispensable in making a preoperative diagnosis. This makes a blind approach unnecessary.

Special roentgen studies must be made of the soft tissues of the neck in cases of dyspnea, hoarseness and dysphagia. These studies are indispensable in cases of foreign body, pharyngeal, laryngeal or tracheal tumor and esophageal obstruction. They are of special value in the fitting of tracheotomy tubes. The extent and clinical course of a lesion, benign or malignant, may frequently be determined more accurately on the roentgenogram than by direct examination. In no instance, however, can the film be substituted for direct examination and biopsy.

DISCUSSION

DR. FRANCIS L. LEDERER: The time allowed is not adequate for speakers of such wide experience to present all this material and do justice to it; nevertheless, they have covered a great deal of ground.

Dr. Malcolm's experience with 350 cases certainly accounts for his enthusiasm, especially due to his profound respect for and knowledge of anatomy and pathology. So far as laryngologists are concerned, difficulty arises in confusing swellings of the neck, particularly in the early stages, with lymphadenitis of pharyngeal origin. When this particular type of lymphadenitis fails to respond to therapy, they begin to think of abscess, and when leukocytosis is absent together with fever, fluctuation or tenderness, they often suspect tuberculous adenitis affecting the cervical glands, especially if the process involves both sides.

The branchial cysts are interesting. If one were confronted with a history that the mass had been present for a long time and had failed to increase in size, one might suspect the presence of a cyst.

The lymphoblastomas for which Dr. Malcolm presented the histopathologic observations are interesting. Hodgkin's disease was illustrated with a particularly excellent slide. I think material aid is being given by the roentgen rays alone in those cases, possibly with the therapeutic test if the lesion responds to roentgen therapy.

Bronchiogenic carcinoma or tumor arising from bronchial remnants occasionally confronts one. A branchioma increases rapidly in size. Usually such a growth is located in the upper anterior cervical triangle. The patient consults the physician with hoarseness, otalgia and pressure symptoms. Metastatic tumors of thyroid, laryngeal, pharyngeal and sinus origin as well as those due to leukemia occasionally present themselves.

The mixed tumor Dr. Malcolm showed on the lantern slides presented three different types of tumorous pathologic changes, with malignant degeneration in one section. This interesting case history dated back to 1912, the patient having had eleven resections before I referred her to Dr. Malcolm. I am indeed sorry that Dr. Malcolm did not have more time to cover fully the details of such interesting cases.

Dr. Holinger's paper illustrates the value of the roentgenogram of the neck as a definite corroborative, diagnostic and prognostic aid. He has presented an excellent selection of material which emphasizes the importance of the close study of the films, which add much to information concerning the structures in this region. The short time allowed the essayist did not permit his covering every type of tumor or pathologic change that might be visualized in this region. The neoplasm and destruction due to tuberculosis and syphilis and the like can also be visualized in the roentgenogram. Dr. Malcolm and Dr. Holinger presented something well worth while.

DR. WALTER H. THEOBALD: I had a somewhat selfish motive in asking Dr. Malcolm to discuss swellings of the neck, for I have been confronted with cases which were troublesome in diagnosis and I thought that some of the rest of the members might be having the same difficulty.

A patient who had a swelling of the neck was recently referred to me from Berlin, and I was impressed with the fact that no laryngeal examination had been made when she was in the United States two years before. At that time her tonsils were removed because of the cervical swelling. Subsequent examination

in her native country disclosed the presence of a sarcoma at the base of the tongue. After vigorous roentgen therapy the swelling and the lesion disappeared.

I wish Dr. Malcolm in closing would tell something about the treatment of inflammatory swellings of the neck by roentgen therapy.

DR. ROBERT B. MALCOLM: I believe that every patient with tuberculosis of the neck in which there is no fluctuation should be treated with roentgen rays. That gives excellent results. If there is fluctuation, an incision should be made, the pus evacuated and the wound sewed tight and treated with roentgen rays. For other inflammatory swellings I think Hilton's is the method of choice.

I feel that all tuberculosis reacts well to roentgen rays. Some of the sarcomas melt away after treatment with radium and roentgen therapy, but, unfortunately, they return with increased vigor and the terminal result is well known. In the treatment of lymphosarcoma roentgen therapy is hopeless.

ABSCESS OF THE BRAIN. DR. ERIC OLDBERG (by invitation).

Abscesses present a multiplicity of problems, and each abscess is a problem in itself in that its position, the type of organism which infects it, its age, the amount of walling off present, the amount of edematous brain surroundng it and the seriousness of the damage which its presence produces are all factors which influence judgment as to treatment.

This paper outlines the radical and conservative methods of treatment in general use. I favor conservative treatment for most abscesses, with repeated tapping and eventual extirpation, if necessary. Statistics are given as to favored sites for abscess, and experiences with the several varieties are detailed.

DISCUSSION

DR. PERCIVAL BAILEY (by invitation): I used to think I knew something about the treatment of intracranial infection, but as I grow older—and I am not so very old—I find that every time I do something I wish I had done something else. For me the anxious period is not that in which there is an abscess fairly well developed but that in which the otologist has done a mastoidectomy and the patient has a drop in temperature and begins to feel better and then shows symptoms again. That is the anxious period not only for the otologist but for the neurosurgeon. What is going on? Is the patient getting a reinfection of the mastoid; is he getting an infection of the sinus that will go on into meningitis, or what? It is an anxious period for every one concerned with the case, and it is the period in which the patient is most difficult to treat, for what the physician is to do depends on the diagnosis, and a diagnosis has to be made quickly. He has to make up his mind what he will do or whether he will do anything. If the patient goes on for a week or two and does not die, the physician usually has plenty of time to make up his mind what he will do and what the condition is.

Suppose that the patient has an abscess and has gone on for a week after his second rise in temperature and that he obviously has no meningitis, for spinal punctures have been made and have revealed only a few cells, he is not showing a daily high temperature and there are no bacteria in the blood stream. He probably has no mastoiditis; so there is no reason to operate again, but he is very sick, vomits and perhaps has some headache and some swelling of the optic disks. The physician then begins to think that there is some infection which has passed through the meninges and into the brain. Then what is he to do? From some bitter experiences I have come to feel, as Dr. Oldberg does, that the less one does the better. If necessary, one may make a small opening and attempt to aspirate the abscess. That should be done only if the patient has choking of the optic disks and increased intracranial pressure, so that he cannot go on without something being done. By tarrying one runs the risk of infection passing into the ventricles, so that the patient has ventriculitis and secondary meningitis, but I think the risk is less than that from interfering with the abscess at that stage. If one simply takes a needle and punctures the abscess and aspirates repeatedly, as often as is necessary, sometimes the abscess will heal. At any rate, it will

sterilize itself and build a thick wall, and one will not have to operate on it immediately. Dandy's statements lead one to believe that healing will always happen, but I think that opinion is exaggerated.

If one punctures the abscess several times and the symptoms continue to recur, how shall one treat the abscess? Under those circumstances, as Dr. Oldberg indicated, one may act in any of several ways. One may put in a drain, allowing the abscess to collapse on itself and allowing the drain to extrude itself so that the lesion will heal. In some cases, however, after the drain is extruded and the wound closes, an abscess forms beneath and has to be operated on subsequently. Another method is to open the dura widely and allow the abscess to extrude itself. That will happen, but in many instances some of the brain will extrude itself with it, and hemiplegia and other unpleasant things are likely to follow. A third method of handling such an abscess has recently been used to a great extent in Paris, particularly by Vincent and his associates. This consists of puncturing several times until the abscess forms a firm wall and then extirpating the abscess as if it were a tumor. That had happened before this treatment was introduced, but by accident.

Vincent now has a large number of cases in which he has deliberately extirpated abscesses in that way, with excellent results. I was so impressed with his work that I have done it myself and have succeeded well. I think this is an advance in surgery, but I am not willing to advocate it for every case on the basis of my own experience—1 case in which extirpation was done by accident and 1 in which it was intentional. It may happen that one attempts to do this with the ventricles, the meninges and everything wide open and is unfortunate enough to rupture the abscess. That happened to me recently. I was enthusiastic about my first success and was attempting to extirpate another abscess. So I did—I made an incision around the wall of the abscess and behind it and was just about to extirpate it when pus began to well out; then I found a fresh daughter abscess just behind the other. I thought that was the end of the patient. The meninges and the ventricles were wide open, and there was pus in the ventricles, in the meninges and all over the brain. Sulfanilamide was given by mouth, and although the organism was a hemolytic streptococcus the child got well. I took the bone flap off, opened the abscess widely, packed gauze into the cavity from which I had extirpated the abscess and let the fluid drain out, and the child got well. The recovery can be credited to sulfanilamide or not, just as one wishes.

I feel that one should puncture an abscess repeatedly until it has time to wall itself off. If one is obliged to continue puncturing it and it continues to reform, then one has a choice of two things—either to insert a rubber drain or to extirpate the abscess as they do in France. I am much impressed with the latter method and shall continue to use it until my results teach me not to do so.

Concerning the time when infection first gets into the cranial cavity, I have never been able to make up my mind. I have been horrified at what otologists do but have not been able to convince myself that I could do any better. I used to be told that one should never enter an infected area but should make another wound entirely separate and drain through the opening. It has always made me shudder to see an otologist open an abscess in the mastoid, put a hemostat through the dura and allow spinal fluid to come out. I have always been sure that meningitis would occur, but to my surprise it has occurred in few cases. I think the answer is that the spinal fluid washes the infection outward and the opening is soon closed by edema and adhesions. So when infection is just getting into the cranial cavity I am satisfied to let the otologist do what he wishes and see what will occur. I have not been able to make any suggestions as to what else to do and have always hoped that the otologist would produce a cure in that stage. After that period is over, if a patient begins to acquire an abscess of the brain, I feel more inclined to take a hand and try to do something for him.

DR. ERIC OLDBERG: I wish to thank Dr. Bailey for his discussion and to repeat that my experience has been most favorable with conservative methods of treatment. I have resorted to radical methods only when the former have failed.

PSYCHONEUROTIC SYMPTOMS IN OTOLARYNGOLOGIC PRACTICE. DR. ALFRED P. SOLOMON (by invitation).

A classification of the clinical manifestations of psychoneuroses is presented, objectifying the problem of their management by the otolaryngologist.

The conversion hysterias, conversion aphonia, deafness, anosmia and loss of taste, are exemplified and their symptoms discussed. The importance of recognizing that conversion hysteria represents a satisfying psychoneurotic adjustment to an emotional conflict or conflicts is stressed. The psychoneurotic adjustment is distinguished from the secondary gain achieved by the presenting symptom in securing attention, interest and sympathy. The problem of treatment in relation to the unconscious purposefulness of this phase of the conversion symptom is explained.

Anxiety hysteria, hypochondriac fixation, schizophrenic hypochondria and manic-depressive somatic delusions are presented as a second group, because the patients seek treatment for somatic symptoms without organic basis. Common to all is an anxious wish to be treated palliatively or surgically in the presence of rejection of the recognition of the conscious or unconscious emotional problem involved. Much emphasis is placed on the fact that the patients prefer organic explanations and that their oft expressed willingness to submit to an operation is not evidence of the organic nature of the complaint.

This group is superficially differentiated by the response of the patient to reassurance by the attending physician. The nature of the transference relationship is explained.

The patients with anxiety hysteria are shown to be grateful for reassurance and more eager than those with the other psychoneuroses of this group to listen to a psychogenic explanation.

The hypochondriac fixations are exemplified by case reports to bring out the deep-seated intensity of the fixation ideology and the attending dangers of doing anything surgically about the symptoms. It is pointed out that the patients resent reassurance. This is contrasted with their characteristically vituperative demands for surgical treatment.

The schizophrenic hypochondriac patients are shown to be even more refractory to reassurance and to be even poorer operative risks. Such treatment often intensifies the conditon. A warning is issued about the paranoid tendencies that sometimes follow operation on such a patient.

The patients with manic-depressive psychoses with somatic delusions, the latter often so prominent that the consequent demands for treatment mask the primary depression, are grateful for reassurance but are unable to hold the relief from anxiety thus gained, although they are even more suggestible to hints dropped that a pathologic condition may exist when the anxiety is thereby increased. The deep-seated feeling of guilt existing in this disease is shown to motivate the symptoms.

Another type of condition, psychoneurosis induced by the use of artificial aids, is described, with attention drawn to the fact that the artificial aid is objected to because of reasons which are related to previous personality problems. If these emotional conflicts are kept in mind when the use of the artificial aid is discussed with the patient, the wearing of it is made much easier.

DISCUSSION

DR. FRANCIS L. LEDERER: Lest Dr. Solomon's paper be taken facetiously, I wish to say that this constitutes to my mind one of the most important subjects that could come before the society. It can well be said that if one eliminates the commonplace things from practice one will have no practice, but I think it is better to say that if one eliminates the psychoneuroses one eliminates most of one's practice. If careful consideration is given the many conditions which Dr. Solomon has so well presented, physicians will recognize many of the patients who have consulted them. One must have a feeling of guilt for having abetted psychoneurotic persons in many instances. It is common practice, if no organic disease is found, to resort to swabs, sprays and tampons. I do not know whether

Dr. Solomon's treatment is better or more effective than that, but I feel that in many cases the condition has been made worse by the classic therapy. Since I have availed myself of the experience of men in Dr. Solomon's field, I have found many interesting entities such as he has presented tonight. Perhaps he could more adequately have covered the ground had he given more case reports, and those present would recognize their Mr. Joneses and Mrs. Smiths, for whom tonsils were removed or other treatment was given but whose symptoms did not subside, and the physician justified himself by thinking that he did them no harm and perhaps some good. I have found suggestive therapeutics a serious menace in this special field of medicine. I am reminded of the patient who comes in with some small growth on the tongue and thinks it is carcinoma. The physician knows it is lymphoid tissue, but he removes it to impress the patient. Then he thinks he has reassured the patient with a negative report of the biopsy, but the patient comes back and the physician applies silver nitrate, and finally the patient becomes discouraged and the same process repeats itself in many other hands. This is only one of the many typical acts in the course of special practice.

I think one can study these problems with interest and profit thereby.

DR. ALFRED P. SOLOMON: I wish to thank Dr. Lederer for what he has said. He has indicated that he has a clear understanding of these problems.

I do not offer a method of treatment but merely make a plea that physicians understand what they are doing and why they do it.

Directory of Otolaryngologic Societies *

FOREIGN

Collegium Oto-Rhino-Laryngologicum Amicitiæ Sacrum

President: Prof. Gunner Holmgren, Karolinska Mediko-Kirurgiska Institutet, Stockholm, Sweden.
Secretary: Prof. Dr. C. E. Benjamins, Verlengde Heereweg, 143 Groningen, Netherlands.

NATIONAL

American Medical Association, Scientific Assembly, Section on Laryngology, Otology and Rhinology

Chairman: Dr. Gordon B. New, Mayo Clinic, Rochester, Minn.
Secretary: Dr. Leroy A. Schall, 270 Commonwealth Ave., Boston.
Place: San Francisco.

American Academy of Ophthalmology and Otolaryngology

President: Dr. Frank E. Burch, 408 Peter St., St. Paul.
Executive Secretary: Dr. William P. Wherry, 1500 Medical Arts Bldg., Omaha.
Place: Palmer House, Chicago. Time: Oct. 10-15, 1937.

American Bronchoscopic Society

President: Dr. Joseph C. Beck, 185 N. Wabash Ave., Chicago.
Secretary: Dr. Lyman Richards, 319 Longwood Ave., Boston.
Place: Atlantic City, N. J. Time: June 2, 1937.

American Laryngological Association

President: Dr. W. B. Chamberlain, 10515 Carnegie Ave., Cleveland.
Secretary: Dr. James A. Babbitt, 1912 Spruce St., Philadelphia.
Place: Atlantic City, N. J. Time: May 31 and June 1-2, 1937.

American Laryngological, Rhinological and Otological Society, Inc.

President: Dr. George M. Coates, 1721 Pine St., Philadelphia.
Secretary: Dr. C. Stewart Nash, 708 Medical Arts Bldg., Rochester, N. Y.
Place: Hotel Traymore, Atlantic City, N. J. Time: June 3, 4 and 5, 1937.

SECTIONS:

Eastern.—Chairman: Dr. D. C. Jarvis, Quarry Bank Bldg., Barre, Vt.
Southern.—Chairman: Dr. Charles D. Blassingame, P. & S. Bldg., Memphis, Tenn.
Middle.—Chairman: Dr. Alfred Lewy, 25 E. Washington St., Chicago.
Mid-Western: Dr. Frederick A. Figi, 436 Tenth Ave., Rochester, Minn.
Western.—Chairman: Dr. David R. Higbee, 3245 Fourth Ave., San Diego, Calif.

American Otological Society

President: Dr. Edmund Prince Fowler, 140 E. 54th St., New York.
Secretary: Dr. Thomas J. Harris, 104 E. 40th St., New York.
Place: Lido Club, Long Beach, N. Y. Time: May 27-28, 1937.

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* Secretaries of societies are requested to furnish the information necessary to keep this list up to date.